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JIMA

Volume 63 (RNI) ◆ Number 10 ◆ October 2019 ◆ Kolkata

JOURNAL of the INDIAN MEDICAL ASSOCIATION

Official Publication of the Indian Medical Association

Indexed in Index Medicus

Volume 117 (JIMA) ♦ Number 10 ♦ October 2019 ♦ Kolkata

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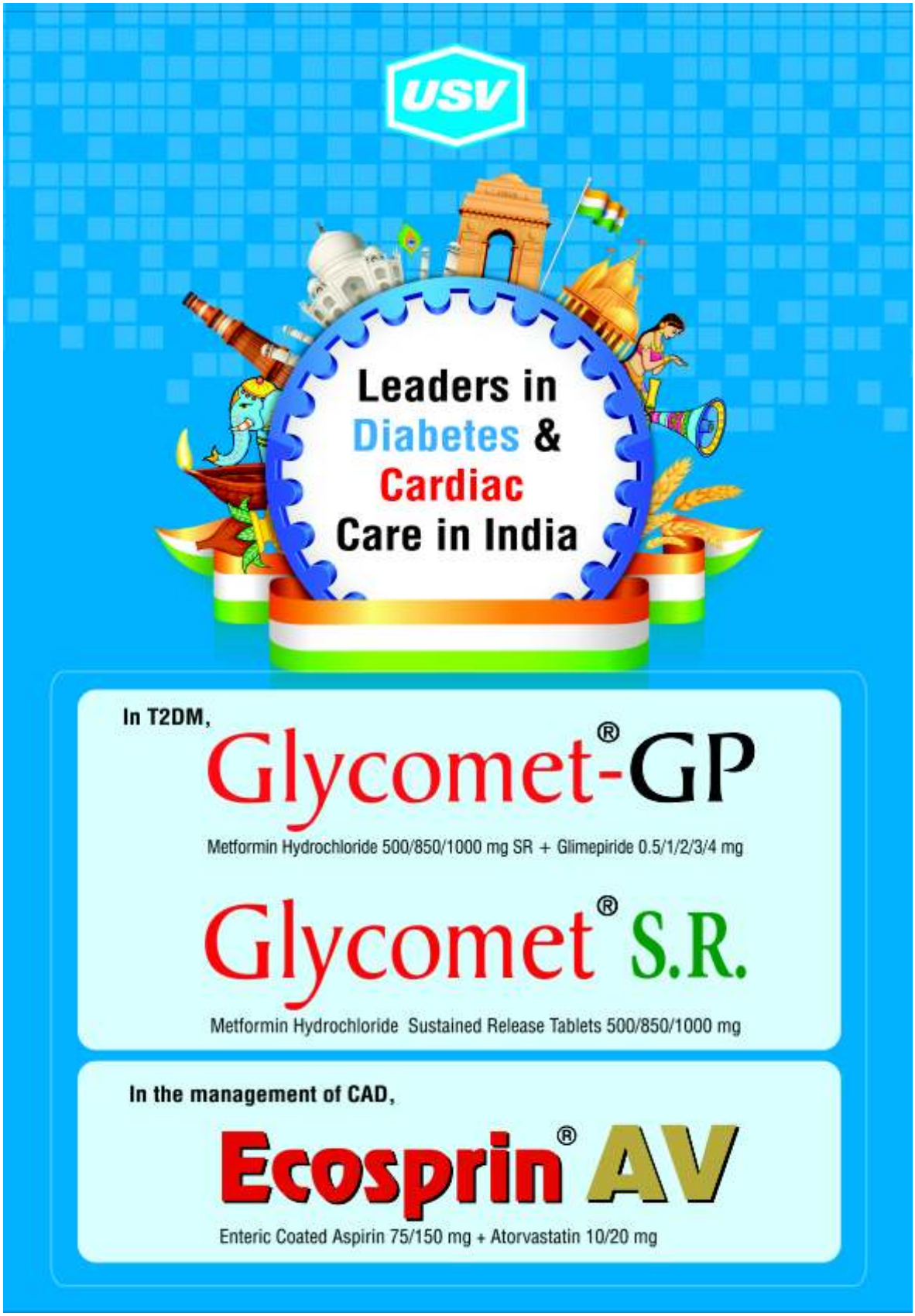
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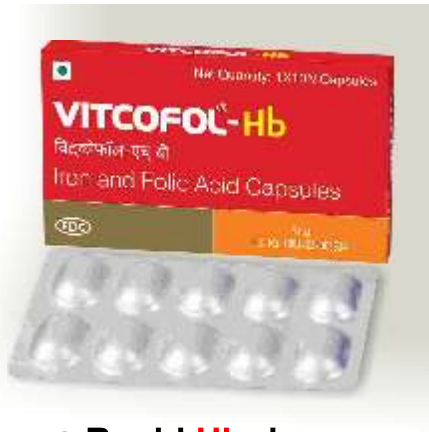

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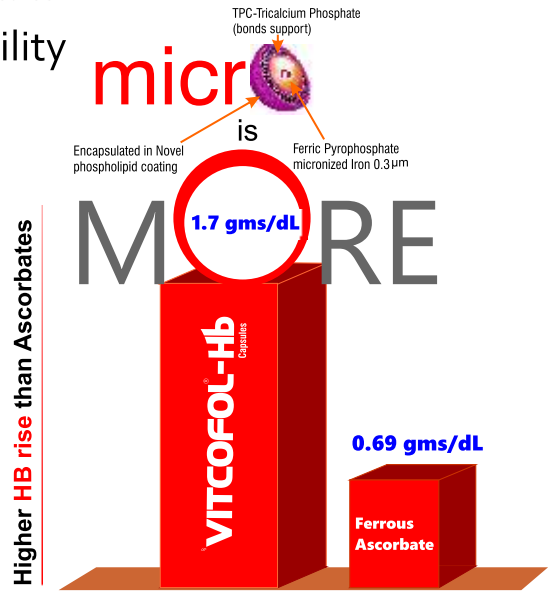

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Editorial

Sports Science and Sports Medicine

Dr Golokbihari Maji
MS (Ortho)
Hony Editor, Journal of IMA (JIMA)

Sports science (also sports and exercise science, sports medicine) is a discipline that studies how the healthy human bodies work during exercise and how sports and physical activity promote health and performance from cellular to whole body perspectives.

Study of sports science traditionally incorporates areas of physiology (exercise physiology), psychology (sports psychology), anatomy, biomechanics, biochemistry and biokinetics. Sports scientists and performance consultants are growing in demand and employment numbers, with the ever – increasing focus within the sporting world on achieving the results possible. Through the study of science and sports, researchers have developed a greater understanding on how the human body reacts to exercises, trainings, different environments and many other stimuli.

Sports science can trace its origin to ancient Greece. The noted ancient Greek physician Galen (131-201) wrote 87 detailed essays about improving health (proper nutrition), aerobic fitness, and strengthening muscles.

New ideas upon the working functioning of the human body emerged during the renaissance as anatomist, physician challenged the previously known theories. These spread with the implementation of the printed words, the result of Gutenberg's printing press in the 15th Century. Furthermore, by the middle of the 19th. century, early medical schools (such as the Harvard Medical School formed in 1782) in the United States, whose graduates went on to assume position of importance in academic and allied medical research.

A number of key figures have made significant contribution to the study of sports science.

- Austin Flint Jr., (1835 – 1915) one of the first American pioneer physician studied physiological responses to exercise in his influential medical text book.
- Edward Hichcock Jr. (1828-1915), Amherst College professor of Hygiene and physical education, devoted the academic career to the scientific study of physical exercise, training and the body.
- George Wells Fitz, M.D. (1860 – 1934) created the first development major in anatomy, physiology and physical training in Harvard University in 1891.
- August Krogh (1874 – 1949) won the 1920 Nobel prize in physiology for discovering the mechanism that controlled capillary blood flow in resting or active muscle.
- Per-Olof Astrand (1922-2015), Professor at the Department of Physiology, Karloriska Institute, Stockholm wrote a seminal paper which evaluated the physical working capacity of men and women aged 4-33 years.

Scope in Study of Sports Science :

Higher education degrees in Sports Science or Human Physiology are also becoming increasingly popular with many universities now offering both under graduate, postgraduate and distance learning degrees in the discipline. Opportunities for graduates in this field include employment as a Physical education teacher, Dietician or Nutritionist, Performance Analyst, Sports coach, Sports therapists, Fitness center manager, Sports administrator, Strength and conditioning specialist or retail manager of a Sports store. Graduates may also be well positioned to undertake further training to become a accredited Physiotherapist, Exercise physiologist, Research scientist and Sports Medical Doctor.

The scope of Sports Science in India :

The potential for sports science in India is huge considering India is the fastest growing economy with a growing interest of sports among the youth and middle classes as well as an abundance of raw talent in the country. Sports like shooting, cricket, boxing, archery, badminton, tennis and squash have constantly being putting up good performances at the world stage, which in turn provides a strong motivation to the youth and society at large.

For India to achieve its sports objectives and to be considered one of the leading sporting nation, it needs to build further upon its strength as well as works towards creating a healthy talent pool in the medal-intensive sports such as aquatics, atheletes, cycling, gymnastics and weight lifting.

India's sports budget for the financial year 2019-2020 has been increased from Rs. 2002.72 (2018-2019) crore to Rs. 2216.92 crore, a hike of 214.20 crore, which is very less keeping in view the range of Sports segments in the country. It has been well said that the progress of a Nation is reflected to the state of its Sports.

India does have the available sports academics and training centers but a majority of the centers lack top class facilities, infrastructure, quality coaches and nutritional support. The policy focus should be to increase participation at the grass root level from a village school to a top ranked university and simultaneously established centers of excellence and high performance centers to condition and polish the talent within the country.

There are many Sports Science Institutions in India. Following are the some important centres.

(1) Institute of Sports Science and Technology (ISST), Pune
(2) Sports Science India, Bhubaneswar, Odisha
(3) Center for Sports Science, Chennai, Tamil Nadu

(4) Indira Gandhi Institute of Physical Education and Sports Sciences, New Delhi.

(5) Symbiosis Schools Sports Science, Pune.

(6) Institute of Exercise and Sports Science in India, Pune, and many others.

While the sports science deals with the totality of the sports, the Sports Medicine is part of it which is a branch of medicine that deals with the physical fitness and the treatment and prevention of injuries related to sports and exercises. Most sports teams employed team physicians for many years, it is only since the late 20th century that sports medicine has emerged as a distinct field in the health care. Orthopedics is a large part of the sports medicine and knee injuries a common theme.

Sports Medicine physicians have completed basic medical education, specialized in residency training, and then further specialized in sports medicine or sports and exercise medicine (the preferred term at present). Specialisation in sports medicine may be a doctor's first speciality (as in Australia, Norway, Italy). It may also be sub-speciality or second specialisation, following a specialisation such as Orthopedics, Family Medicine, Paediatrics. The various approaches reflect the medical culture in different countries.

Specialising in the treatment of atheletes and other physically active individuals, sports and exercise medicine physicians have extensive education in musculo skeletal medicines. Sport and Exercise Medicine (SEM) doctors treat injuries such as muscle, ligament, tendon, bone problem, but may also treat chronic illnesses that can affect the physical performances, such as asthma and diabetes. SEM doctors also advise on managing and preventing injuries.

SEM doctors / consultants also deliver clinical physical activity, intervention, negating the burden of the disease directly attributable to physical inactivity and the compelling evidence for the effectiveness of exercise in primary, secondary and for tartiary prevention disease.

Sports Injuries :

Sports injuries are injuries that occur during sport, atheletic activities, or exercising. According to a study performed in Snatford university, 21% of the injuries are observed in the elite college atheletes, caused the athelete to miss at least one day of sport, and approximately 77% of these injuries involved the lower leg, ankle and foot. In addition to those sports injuries, a leading cause of death related to sports injuries is traumatic head and neck occurrences. When an athelete complains of pain or an injury the key to a diagnosis is to obtain a detailed history and examination. An example of a format used to guide an examination treatment plan is a S.O.A.P. note or, subjective, objective, assessment, plan. Another important aspect of sports injury is prevention which helps to reduce potential sports injuries. It is important to establish sports specific dynamic warming, stretching, and exercises that can help prevent injuries common to each individual sport. Creating an injury prevention programme also include education in hydration, nutrition, monitoring team members 'at risk'.

Top 10 common sports injuries :

- Tennis or Golf elbow
- Hamstring strain
- Sciatica
- Shin splints
- Groin pull
- Concussion
- Anterior Cruciate Ligament (ACL) tear or strain in knee
- Hip flex or strain
- Shoulder injury
- Patello femoral syndrome

Prevention of sports injuries :

Sports injuries generally occur for two different reasons: trauma and overuse. While traumatic sports injuries are usually obvious, dramatic scenes, like when we see a player fall down clutching their knee, overuse injuries are more common. Overuse injuries often occur when the body is pushed past its current physical limits or level conditioning – but poor technique and training errors such as running excessive distance or performing inadequate warmups frequently contribute. To help keep you or your young athele from experiencing a sports related injury the following prevention tips should be followed.

(1) Set realistic goals
(2) Plan and prepare
(3) Warm up and cool down
(4) Take your time
(5) Listen to your body

Sports Medicine in India :

A layman think Sports Medicine is a subject that take care of the sportsperson and atheletes. It is still in the infant stage in India where it started to develop in 1970s with the beginning of Indian Association of sports medicine. In 1983 at Patiala, a specialised school for Sports Medicine was started by the name of Netaji Subhas National Institute of Sports. Many distinguished sports medicine specialists are the product of this famous institution. Later in 2010, Master degree in Sports Medicine has been started in Sri Ramchandra University, Chennai and Guru Nanak, Dev University, Amritsar. Gradually other institutions developed like,

(1) Armed forces Medical College, Pune
(2) Vardhaman Mahavir College, Delhi

Atheletes, sportsman and sports related persons like coaches, management as well as the common people are becoming more aware of exercise and have started recognising the importance of sports medicine. Sports science requires to observe, measure, evaluate, analyse and document different aspects of sports and together with clinical medical practice – will benefit both active people and atheletes.

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Guest Editorial

Prof (Dr) Kiran Kumar Mukhopadhyay
MS (Ortho)
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Dr Rajeev Raman
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MIS — How Safe for Orthopaedic Surgeons

Minimally Invasive Surgery (MIS) has gained exponential popularity among Patients and Surgeons in recent years. Certainly, MIS is beneficial for patients in particular cases. But a burning question has been raised regarding its safety among Orthopedic surgeons. Studies show that Interlocking nailing and spine surgery has a high rate of radiation among surgeons which is much higher than the normal limit[1-3].

As a result of global concern, the International Commission on Radiological Protection and the National Council on Radiation Protection & Measurements defined guidelines to put individuals exposed to greater than 10% of the annual OEL to undergo regular monitoring. The annual OEL(Occupational Exposure Limit)for the whole body is 5000 μ rem[1].

The 0.5 mm lead aprons are not as protective as it blocks only over one-third of the radiation scattered towards the surgeon[4].

The radiation effect may damage the chromosomes in somatic cells, which typically manifest as cancer; in germ cells, as genetic defects in offspring[5].

Spine surgeons are more at an increased risk of radiation exposure compared with other musculoskeletal surgeons. This radiation exposure may be 10-12 times greater radiation dose than non-spinal orthopaedic procedures in comparison to fluoroscopically assisted pedicle screw insertion[2].

Another study shows that there is much higher radiation risk in MIS lumbar microdiscectomy than the traditional open technique. The increase in radiation exposure to the surgeon's eyes/thyroid, chest, and hand in MIS are statistically significant compared to open cases. These values are alarming and are each approximately 10 to 20 times greater in the MIS group[6].

Chronic radiation exposure may exhibit the first effect in the eyes in the form of cataracts[7].

It has been documented that Orthopaedic surgeons have an increased incidence risk of cancer compared to non-exposed fields of surgeons[8].

The thyroid gland is exposed to radiation, and it is thought that eighty-five per cent of papillary carcinomas of the thyroid is due to radiation[9].

What is of more concern that though Orthopedic and especially Trauma surgeons' use image intensifiers during operations extensively, particularly in minimally invasive procedures, they often neglect the radiation[10].

A recent survey among orthopaedic Surgeons showed that a significant number of surgeons reported no concerns over radiation exposure. And most surgeons did not even have adequate technical knowledge regarding the use of fluoroscopy devices[11].

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Review Article

Orthopaedic disability evaluation for general practitioners

K Sreenivasulu

Orthopaedic disability involves the disability of both upper and lower limbs and spine. A simple evaluation of orthopaedic disability for graduate practitioners is described after enumerating the traumatic and non traumatic causes of orthopaedic disability. The trauma may result in amputations or disarticulations of upper or lower limb. This knowledge can be used in courts and while issuing the disability certificates to the orthopaedically handicapped individuals for getting the benefits from the Government and Non Government Agencies. [*J Indian Med Assoc* 2019; **117(10)**: 13-5 & 22]

Key words **: Orthopaedic disability, Graduate practitioners, Amputations, Disarticulations.**

The evaluation of orthopaedic disability for general practitioners and other specialists without post graduate qualification in orthopaedics, is rarely found in Indian Journals and Text Books of Orthopaedics. Hence, the orthopaedic disability evaluation is briefly presented in this special article in simple language.

Definition of Disability :

The state of being incapacitated or disabled is called disability. Orthopaedic disability is the physical disability involving both upper and lower limbs and spine. The disability is directly proportional to the functional loss and vice versa[1].

Causes of Orthopaedic Disability :

Trauma (the commonest) and non traumatic conditions-diabetic gangrene, gas gangrene, vascular gangrene (due to arteriosclerosis, thrombosis, thromboangitis obliterance), poliomyelitis, cerebral palsy, quadriplegia, hemiplegia, paraplegia and monoplegia, Hansen's disease, Burns, nerve disorders, spina bifida, chronic osteomyelitis, arthritis, myopathies, malignant bone tumours, dwarfism, polyarthritis, rickets, osteomalacia, osteogenesis imperfecta, multiple exostoses, fibrous dysplacia, congenital disorders-amelia, phocomelia, congenital dislocation of hip, congenital talipes equinovarus, congenital absence of femur, congenital shortening of lower limb, scoliosis, khyphosis. Due to the above traumatic and non traumatic causes, there may be amputation of a limb or part of limb or disarticulation or loss of function of limbs[2].

Types of Orthopaedic Disability[3] :

The various causes detailed above result in temporary or permanent disability. In all cases of trauma, the temporary disability can be total or partial. THE TEMPORARY TOTAL DISABILITY is found during the period, in which, the injured person is completely unable to do any work. The injured person is always admitted as inpatient. This period of temporary total disability is about 3 to 4 months, for all the fractures of long bones and dislocations of major joints in both upper and lower limbs and spine and it is about 1 to 2 months for the fractures of small bones or dislocations of small joints of hands and feet. During this period of temporary total disability, the injured workman should be paid full salary, as the percentage of disability is 100. The temporary partial disability is considered from the 5th month of injury date to a maximum of 12 months, ie, 8 months for all the fractures of the long bones or dislocations of larger joints in both upper and lower limbs and spine, when associated with complications of infection or joint stiffness. This period is from 3rd month after the injury date to 6th month (4 months) for all fractures of small bones and dislocations of small joints of hands and feet, in the event of complications of infection and joint stiffness. During this period, the disability is less than 100 percent. The patient is treated as outpatient and can do light work and can be paid full salary sympathetically, if workman was injured at the work place.

Permanent Disability :

After completion of orthopaedic treatment, physiotherapy and rehabilitation measures, including occupational therapy in a maximum period of 12 months from the injury date for all fractures of long bones and dislocations of all large joints and for 6 months for all fractures for small bones and dislocations of small joints of hands and feet, if the injured person (workman) has any residual disability, it is called permanent disability. In the case of disability due to non traumatic conditions, the temporary disability period may be extended upto 5 years from the starting date of the conditions depending on the type of disorder and after 5 years, the disability should be considered as permanent disability[4].

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Evaluation of Permanent Orthopaedic Disability :

The permanent orthopaedic disability was earlier evaluated into mild disability (0% to 40%), Moderate disability (41% to 75%), severe disability (76% to 99%), total disability (100%)[5]. This kind of evaluation is obsolete and should be replaced with estimation of disability in exact percentage (not in the range) for all medicolegal purposes and for benefits from Government and Non Government Agencies.

All the causes of orthopaedic disability stated above may result in amputation of a limb or part of a limb or disarticulation. In the absence of amputation and disarticulation, there may be loss of function in terms of stiffness of joints with loss of normal movements, weakness of muscles, deformity or shortening of limbs[6].

The evaluation of permanent orthopaedic disability is described under the headings of (1) Disability of amputation/disarticulation and (2) Disability in conditions other than amputations/disarticulations[7].

Evaluation of Permanent Orthopaedic Disability of Amputations and Disarticualtions

In earlier times, during amputations, optimum levels and minimum stumps were followed for fitting the conventional prostheses. Since the time of availability of modern total contact prostheses, the optimum levels of amputations and minimum stumps have become of less important. Hence, every effort is made by the surgeon to preserve and save as much normal tissues as possible without observing the optimum level of amputation and minimum stump. Hence this author has revised rationally the percentage of permanent orthopaedic disability as given below.

Lower Limb Amputations or Disarticulation[5-10] :

(1) Hind quarter amputation: 100%

(2) Hip disarticulation: 90%

(3) Above knee amputation : (a) Stump length ¼ or less than ¼ of length of thigh: 85%, (b) Stump length ½ to ¼ of length of thigh : 80%, (c) Stump length ½ to more than ¾ of length of thigh : 75%

(4) Knee disarticulation : 70%

(5) Below Knee amputation : (a) Stump length ¼ or less than ¼ of length of leg: 60%, (b) Stump length ½ to ¼ of length of leg: 55%, (c) Stump length ½ to more than ¾ of length of leg 50%

(6) Ankle disarticulation: 45%

(7) Symes amputation: 30%

(8) Lisfranc's amputation: 25%

(9) Loss of all toes due to disarticulation at metatarso-phalangeal joints : 15%

(10) Loss of all toes in the proximal/middle phalanges: 10%

(11) Disarticulation of big toe at the metatarso-phalangeal Joints : 10%

(12) Amputation of big toe through proximal phalanx: 7%

(13) Disarticulation of big toe through interphalangeal joint : 5%

(14) Amputation of big toe through distal phalanx: 3%

(15) Loss of 2nd toe due to disarticulation at metatarso-Phalangeal joint or amputation through proximal or middle phalanx : 2%

(16) Disarticulation through metatarsophalangeal joint or Amputation through proximal/middle phalanx of 3rd toe 4th toe or 5th toe : 1%

Upper Limb Amputations and Disarticulations :

(1) Fore quarter amputation : 100%

(2) Shoulder disarticulation : 90%

(3) Above elbow amputation : (a) Stump length ¼ or less than ¼ of length of arm: 85%, (b) Stump length ½ to ¼ of length of arm: 80%, (c) Stump length ½ to more than ¾ of length of arm: 75%

(4) Elbow disarticulation : 70%

(5) Below elbow amputation : (a) Stump length ¼ or less than ¼ of fore arm: 60%, (b) Stump length ½ to ¼ of forearm: 55%, (c) Stump length ½ to more than ¾ of length of forearm: 50%

(6) Disarticulation of wrist joint with loss of whole hand: 45%

(7) Disarticulation of carpometacarpal joint of thumb: 30%

(8) Amputation through first metacarpal of thumb: 20%

(9) Disarticulation through metacarpophalangeal joint of Thumb 18%

(10) Disarticulation through interphalangeal joint of thumb:15%

(11) Amputation through the distal phalanx of thumb: 10%

(12) Disarticulation through carpometacarpal joints of all Fingers except thumb: 15%

(13) Amputations through metacarpals of index, middle, ring and little fingers:10%

(14) Index finger and middle finger : (a) Disarticulation through metacarpophalangel joint: 3%, (b) Amputation through proximal phalanx : 2%, (c) Disarticulation through proximal interphalangeal joint : 1 ½ %, (d) Amputation through middle phalanx: 1%, (e) Disarticulation through distal interphalangeal joint or Amputation though distal phalanx: ½%

(15) Ring finger and little finger : (a) Disarticulation through metacarpophalangeal joint: 2%, (b) Amputation through proximal phalanx: 1 ½%, (c) Disarticulation through proximal interphalangeal joint : 1%, (d) Amputation through middle phalanx or disarticulation

Through distal interphalangeal joint or amputation

Through distal phalanx: ½%

Evaluation of Permanent Orthopaedic Disability in Conditions Other Than Amputations and Disarticulations:

The percentage of permanent orthopaedic disability should be evaluated as related to the limb/limbs/spine and whole body. The following method is followed: While evaluating,it is important to remember that the orthopaedic disability is confined to the disability of both upper and lower limbs and spine due to the causes mentioned above[9]. In all disabled persons, history, clinical examination and if necessary X-ray, CT scan, MRI scan and relevant investigations are used to find out the cause of the affected limb/limbs and spine. As stated above, orthopaedic disability involves the four limbs and spine. The maximum disability percentage is 100. This one hundred percentage of disability is arrived by giving each limb 20%. Hence, the combined disability of four limbs is 80% disability and the spine is allotted 20% disability. This percentage of disability is related to the whole body. Thus the total percentage of orthopaedic disability of four limbs and spine is 100%.

The other method is to allot 100 points or 100% disability for each lower limb, upper limb and spine and express the percentage of disability related to the limb or spine. Thus the orthopaedic disability is expressed in two parts. The first part of the opinion consists of percentage of orthopaedic disability to the lower limb, upper limb or spine individually. The second part of the opinion contains the percentage of disability of one or more limbs and spine in relation to the whole body. It means that the first part of the opinion contains the rating of percentage in 100% for each lower limb, upper limb and spine. If only one of the four limbs or spine alone is involved, the first part of opinion gives an idea of the percentage of disability of each limb or spine, considering the rating of 100% disability. The second part of the opinion as the percentage of permanent disability related to the whole body, ie, four limbs and spine is obtained by dividing the percentage of disability limb or spine by the numerical of 5. This method of expressing opinion in two parts will avoid confusion. For example if the disability arrived at is 45% to the right lower limb alone considering 100 points or 100% disability to the lower limb, the final opinion of part one is 45% of lower limb. Part two 45/5=9% of whole body.

Permanent Disability Evaluation of Lower Limb :

Disability evaluation of each affected lower limb is done separately. Each lower limb is divided into three segments as given below:

(1) Hip joint and thigh segment

(2) Knee joint and leg segment

(3) Ankle joint and foot segment

100% or 100 points allotted to each lower limb are divided as follows :

Range of movements of hip joint: 15 points—mild stiffness-5 points, moderate stiffness- 10 points, severe stiffness- 15 points.

Muscle power of muscles acting on hip joint : 15 points--3 points for loss of one grade of muscle power (3X5=15).

Range of movements of knee joint : 15 points – mild stiffness-5 points, moderate stiffness-10 points, severe stiffness-15 points.

Range of movements of ankle joint – 15 points – mild stiffness – 5 points, moderate stiffness – 10 points and severe stiffness –15 points.

Muscle power of muscles acting on ankle joint: 15points – 3 points for loss of one grade of muscle power.

One point for deformity of hip, knee and ankle totalling of 3 points.

One point for each inch of shortening of lower limb up to 7 inches totalling 7 points.

Thus the total of 100 points allotted to each lower limb for 100% disability.

Permanent Disability Evaluation of Upper Limb :

Disability evaluation of each affected upper limb is done separately. Each upper limb is divided into 3 segments as follows:

(1) Shoulder joint and arm segment

(2) Elbow joint and forearm segment

(3) Wrist joint and hand segment

100% or 100 points allotted to each upper limb are divided as given below :

Range of movements of shoulder joint: 15 points – mild stiffness–5 points, moderate stiffness–10 points and severe stiffness–15 points.

Muscle power of muscles acting at shoulder joint : 15 points. 3 points for loss of one grade of muscle power. (3X5=15)

Range of movements of elbow joint: 15 points–mild stiffness–5 points, moderate stiffness–10 and severe stiffness–15 points.

Muscle power of muscles acting at elbow joint : 15 points. 3 points for loss of one grade of muscle power. (3X5=15)

(Continued on page 22)

Original Article

Comparison of incidence of Posterior Capsular Opacification following implantation of different types of Intraocular Lenses

Subhankar Home[1], Shreya Banerjee[2]

(a) To find out incidence of Posterior Capsular Opacification (PCO) in 3 different types of Intraocular Lens (IOL) (Foldable silicone, Foldable acrylic hydrophobic, Foldable acrylic hydrophilic). (b) To compare the development of PCO in 3 different types of IOL (Foldable silicone, Foldable acrylic hydrophobic, Foldable acrylic hydrophilic IOL).

A prospective non-randomised study was conducted on 150 patients undergoing cataract surgery in BR Singh Hospital within the time period of January 2017-August 2018. Patients were divided in three groups, 50 in each group. Group A received foldable hydrophobic acrylic IOL, Group B received foldable hydrophilic acrylic and Group C received foldable silicone IOL. They were followed in postoperative period at interval of 6, 12 and 18 months. Patients were clinically examined for best corrected visual acuity (BCVA) by logmar chart. Posterior Capsular Opacification was evaluated as per following grading scale : (1) No PCO, (2) Minimum wrinkling of capsule with a fine layer of Lens Epithelial Cells (LECs), (3) Mild honeycomb PCO, thicker layer of LECs with dense fibrosis, (4) Classic Elschnig's pearl, very thick layer of LECs, (5) Severe opacity with darkening effect.

In 3 groups, most of the patients were in the age group of 66 years to 80 years. Incidence of PCO was maximum in group C (26%) and minimum in group A (8%). Only 4 among 50 patients with hydrophobic IOL developed PCO after 18 months of surgery. In group B,7 patients developed PCO. In group C,13 patients developed PCO and among them 2 have the PCO score of 3 and 4.

Incidence of PCO in hydrophobic IOL is 8%, in hydrophilic group,it is 14% and in the silicone group it is 26% that means hydrophobic IOL is least associated with development of PCO. Development of posterior capsular opacification is dependent on the IOL material used. Hydrophobic IOL is associated with least PCO development after 18 months of surgery and silicone IOL are maximally associated with development of PCO.

[*J Indian Med Assoc* 2019; **117(10):** 16-9]

Key words **: Posterior Capsular Opacity, Cataract, Intraocular Lens.**

The crystalline lens is a biconvex, avascular, transparent structure enclosed by a capsule, which is a basement membrane secreted by lens epithelium. The lens is conceptualized as consisting of the nucleus, the central compacted core, surrounded by the cortex. The normal lens is transparent; any congenital or acquired opacity in the lens capsule or substance, irrespective of the effect on vision, is a cataract.

Small incision cataract surgery and the phacoemulsification are modern surgical methods of cataract extraction.

Opacification of the posterior capsule caused by postoperative proliferation of cells in the capsular bag remains the most frequent complication of cataract-intraocular lens (IOL) surgery[1,2]. Secondary cataract (PCO) has been recognized since the origin of Extra Capsular Cataract Extraction (ECCE) surgery and was noted by Sir Harold Ridley in his first IOL implantations[3,4]. The interval between surgery and PCO varies widely, ranging from three months to four years after the surgery. Although, the causes of PCO are multifactorial as reported in several studies[5], there is an inverse correlation with age. Young age is a significant risk factor for PCO, and its' occurrence is a virtual certainty in paediatric patients[6-8].

Visual symptoms do not always correlate to the observed amount of PCO. Visually significant PCO is usually managed by creating an opening within the opaque capsule using the Nd: YAG laser. A surgical posterior capsulotomy may be indicated in children for dense PCO associated with secondary membrane formation.

Materials and Methods

A prospective non-randomized study was conducted

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in the period of March 2010-August 2011 on patients undergoing phacoemulsification surgery in BR Singh Hospital. The study protocol has been approved by the institutional ethical committee and scientific committee. Written consent was obtained from patients.

Study Technique :

Patients detected with cataract in the OPD of Department of Ophthalmology in BR Singh Hospital were selected for this study as per the inclusion and exclusion criteria. Patients were evaluated preoperatively by BCVA, applanation tonometry, slitlamp examination, fundus examination and biometry. Total 150 patients were included in the study. They were divided in three groups 50 in each group. Group A received foldable hydrophobic acrylic IOL, Group B received foldable hydrophilic acrylic and Group C received foldable silicone IOL. All eyes underwent an uneventful surgery with posterior chamber IOL implantation. All surgeries were performed by a single surgeon .A clear corneal or scleral temporal incision was made with a 2.8 mm keratome blade. Viscoelastic was used to deepen the anterior chamber and continuous curvilinear capsulorrhexis of 5-6 mm (d) was performed. Hydrodissection and phacoemulsification were done and the cortex was removed with automated irrigation and aspiration. Irrigation and aspiration was done. Viscoelastic was then injected into the bag and in-the-bag implantation of posterior chamber IOL was done. They were followed in postoperative period at interval of 6, 12 and 18 months. Patients were clinically examined for BCVA by logmar chart. Posterior capsular opacification was evaluated as per following grading scale:

(1) No PCO

(2) Minimum wrinkling of capsule with a fine layer of LECs.

(3) Mild honeycomb PCO, thicker layer of LECs with dense fibrosis

(4) Classic Elschnig's pearl, very thick layer of LECs

(5) Severe opacity with darkening effect

Plan for Analysis of Data :

The information obtained from this study was tabulated in a master chart and then statistically analysed, using standard methods like mean, standard deviation and frequency.

Statistical Methods :

Data is expressed as mean ±SD for continuously distributed variables and in absolute numbers and percentages for the discrete variables.

Tests of significance

(1) Unpaired Student's t-test

(2) Chi-square test

(3) Kruskal–Wallis one-way analysis of variance

(4) Mann–Whitney *U* test

Analysis and Result

Table 1 and Fig 1 show the incidence of PCO, developing after 18 months of IOL implantation in different groups of lenses. Incidence of PCO is maximum in group C (26%) and minimum in group A (8%).

Table 1 — *Incidence of PCO*

Group	Percentage of PCO
A	8%
B	14%
C	26%

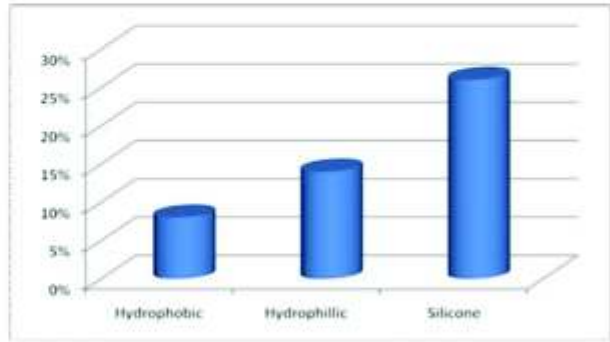

Fig 1 — Incidence of PCO

BCVA after 6 Months :

Table 2 and Fig 2 show the postoperative BCVA in Logmar chart after 6 months of surgery. Here majority of patients had BCVA of 0.3.

Table 2 — *Postoperative BCVA in Logmar chart after 6 months of surgery*

Group	0	0.3	0.5	0.6	0.7	0.8	1
A	7	23	11	3	5	1	0
B	4	24	15	2	4	1	0
C	5	26	9	7	1	2	0

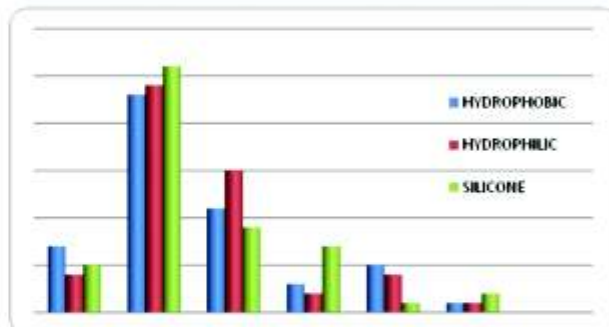

Fig 2 — Postoperative BCVA in Logmar chart after 6 months of surgery

BCVA after 12 Months :

Table 3 and Fig 3 show the postoperative BCVA in Logmar chart after 12 months of surgery. Here majority of patients had BCVA of 0.3.

Table 3 — *Postoperative BCVA in Logmar chart after 12 months of surgery*

Group	0	0.3	0.5	0.6	0.7	0.8	1
A	9	21	12	2	6	0	0
B	3	25	14	3	4	0	1
C	4	27	9	7	1	2	0

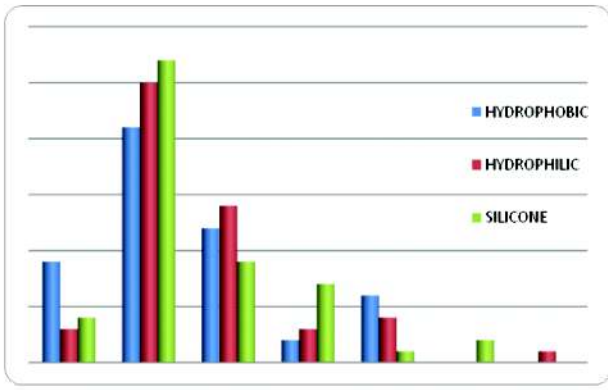

Fig 3 — Postoperative BCVA in Logmar chart after 12 months of surgery

BCVA after 18 Months :

Table 4 and Fig 4 show the postoperative BCVA in Logmar chart after 18 months of surgery. Here majority of patients had BCVA of 0.3.

Table 4 — *Postoperative BCVA in Logmar chart after 18 months of surgery*

Group	0	0.3	0.5	0.6	0.7	0.8	1
A	9	20	13	3	3	0	0
B	2	24	15	3	4	0	1
C	1	25	13	7	0	2	1

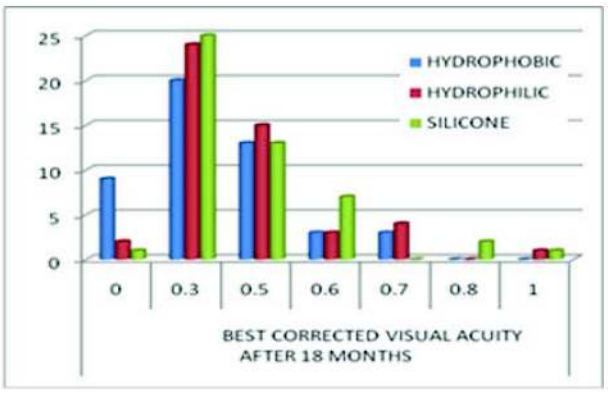

Fig 4 — Postoperative BCVA in Logmar chart after 18 months of surgery

PCO Score after 18 Months in Different IOL Biomaterial :

Table 5 and Fig 5 show distribution of patients according to the PCO score in foldable hydrophobic, foldable hydrophilic and foldable silicone IOL after 18 months of surgery as evaluated by the slit-lamp examination. Most of the patients are having PCO score 0. Only 4 among 50 patients with hydrophobic IOL developed PCO after 18 months of surgery. In group B, 7 patients developed PCO. In group C, 13 patients developed PCO and among them 2 have the PCO score of 3 and 4. Applying the Kruskall Wallis statistical test the p value is 0.034 that is stastically significant. This result signify that the development of PCO is dependent on biomaterial of the IOL. Table 6,7 and Fig 6 show the statistical analysis.

Table 5 — *Distribution of patients according to the PCO score*

Group	0	1	2	3	4
A	44	3	1	0	0
B	42	6	1	0	0
C	36	6	5	1	1

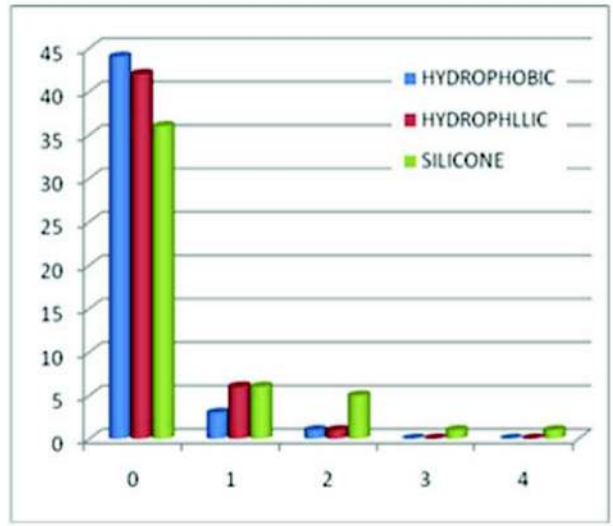

Fig 5 — Distribution of patients according to the PCO score

Kruskal-Wallis Test :

Table 6 — *Distribution of mean rank of PCO score*

Ranks			
	Group	N	Mean Rank
PCO_Score	A	48	67.44
	B	49	71.51
	C	49	81.43
	Total	146	

Table 7 — *p value result of PCO score*

Test Statistics[a,b]	
PCO_Score	
Chi-Square	6.783
Df	2
Asymp. Sig.	0.034
(a) Kruskal Wallis Test	
(b) Grouping Variable : group	

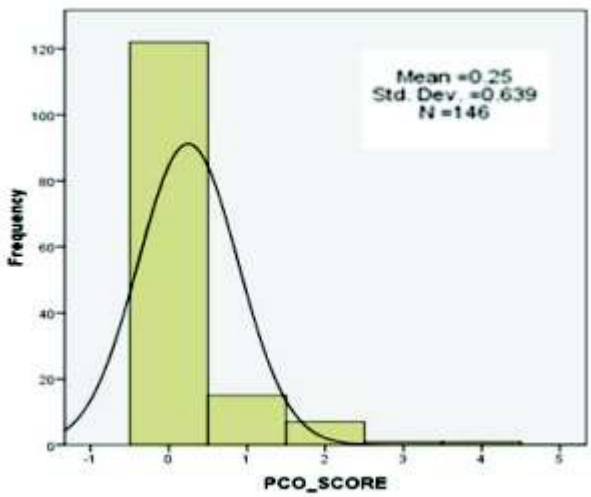

Fig 6 — Frequency of PCO score according to the Kruskall Wallis test

Discussion

Opacification of posterior capsule caused by postoperative opacification of cells in the capsular bag remains the most frequent complication of cataract surgery (Werner L 2000).

In our study the mean age of the patients in group A is 67.42 (SD -7.29), in group B is 67.18 (SD -9.24) and in group C is 67.42 (SD -7.29) with p value of >0.05 which is statistically insignificant and cannot alter the result.

In this study all the three groups had a male female ratio of 3:2 and there is no statistical significance.

In pre-operative evaluation in our study, most of the patients had grade 2 nuclear sclerosis, grade 2 cortical cataract and grade 2 posterior Subcapsular cataract.

There is preliminary evidence that the hydrophobic acrylic IOL biomaterial provides enhanced capsular 'bioadhesion' (Linnola R *et al* 1997, Linnola RJ *et al* 2000). They proposed the sandwich theory for explanation of less PCO with hydrophobic IOL material. This is tested in pseudophakic autopsy implanted with PMMA, silicone, hydrophilic acrylic, and hydrophobic acrylic IOLs. Results suggest that fibronectin may be the major extracellular protein responsible for the attachment of hydrophobic acrylic IOL in capsular bag.

In our study the incidence of PCO in hydrophobic IOL is 8%, in hydrophilic IOL is 14% and in silicone IOL is 26%. PCO values of the entire IOL optic area (0.12±0.13 and 0.024±0.02) as well as in the central 3-mm optic zone (0.06±0.11 and 0.001±0.003) was significantly higher in the single-piece hydrophilic acrylic IOL group one year postoperatively (P<0.05). In 33.3% of cases of the single-piece hydrophilic acrylic IOL group, contraction of haptics to IOL optics was present one year postoperatively, which was not present in any case of the single-piece hydrophobic acrylic IOL group[9].

At 1 year, the hydrophilic acrylic IOL group had a significantly greater percentage area and severity of PCO than the hydrophobic acrylic IOL group (P<0.001)[10].

In our study BCVA assessed by the logmar chart mostly was 0.3 after 6, 12 and 18 months.

In our study PCO score mean is 0.25±0.693 and the p value is 0.034 that is statistically significant (Chi-Square value=6.783, degree of freedom 2). That means development of PCO is dependent on IOL material.

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Original Article

A prospective study of a long proximal femoral nail in reverse oblique and subtrochanteric fractures

Hriday Krishna Mandal[1], Nabarun Saha[2], Ritwika Nandi[3], Rabindra Nath Soren[4]

Subtrochanteric fracture is common among elderly population.Dilemma for treatment modalities of Subtrochanteric fracture has been there for decades. In this prospective study total 30 cases (12 Reverse oblique & 18 Subtrochanteric fractures) were treated with long proximal femoral nailing from year 2014 to 2017. Patients of age 18 years & above were included (male: female= 6:24).Clinical and functional outcomes were assessed according to Harris hip score. Out of 30 cases 24 patients had a good outcome, 5 patients had fair outcome and 1 patient had poor outcome due to difficulty in squatting and sitting cross-legged. Radiologically all fractures were united. [*J Indian Med Assoc* 2019; **117(10):** 20-2]

Key words **: Proximal Femoral Nail, Subtrochanteric Fracture.**

The incidence of proximal femoral fractures is rising with increased involvement of elderly osteoporotic patients due to high life expectancy[1] and an increasing number of high-velocity trauma occurring due to road traffic accidents. It is one of the common causes of morbidity & mortality in elderly patients[2,3]. Intertrochanteric and subtrochanteric fractures make up of about 50% of hip fractures[4-6]. Reverse oblique trochanteric fractures have inherent instability[7,8]. The biomechanical test has confirmed that in subtrochanteric region axial loading through the hip joint creates a large moment arm, with significant lateral tensile stress and medial compressive load[9]. This biomechanical characteristic along with poor vascularity caused by the predominance of cortical bone and variance of muscular pull by abductors and adductors creating torsional effects that lead to significant rotational shear forces– all these are responsible for the difficulty in reduction and internal fixation leading to malunion, delayed union and mechanical failure of implants[2,10].The preferred treatment of choice in both these fractures is operative and the goal of treatment is to achieve stable acceptable reduction with relatively rigid internal fixation for early ambulation and to prevent the dangers associated with prolonged recumbancy[11]. The objective of this series is to study the functional outcome of patients with Reverse oblique & Subtrochanteric proximal femoral fractures treated with a long proximal femoral nail.

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Materials and Methods

In this prospective study total 30 cases (12 Reverse oblique & 18 Subtrochanteric fractures) were treated with long proximal femoral nailing from year 2014 to 2017. Patients of age 18 years & above were included (male: female = 6:24). Road traffic accident was a common mechanism of injury in young patients while domestic fall was more common in the elderly. Medically unfit, terminally ill & patients unwilling to operate were excluded. The average duration between admission & operation was 6 days. Pre-operative upper tibial skeletal traction was given in 10 patients in whom there was delay in surgical intervention due to medical problems. All patients underwent spinal or epidural anaesthesia and were placed in a fracture table in the supine position. The affected limb was kept inadducted position and trunk of the patient was pushed 10 to 15° to the contralateral side to make greater trochanter more prominent. Closed reduction was tried under image intensifier control before making an entry point for nail. Adequacy of reduction was assessed by the restoration of posteromedial cortex and neck shaft angle to normal in both anteroposterior and lateral view. 8 cases of reverse oblique and 10 cases of subtrochanteric fractures required open reduction. In some cases of unstable or long oblique fracture pattern stabilization with stainless steel wire circlage were needed. A 5 cm incision was taken from the tip of the greater trochanter proximally. The entry point was on the tip of the greater trochanter. A guidewire was passed through the tip of the trochanter distally. Reaming was done over the guidewire according to the planned nail. The nail of appropriate size (between 10 and 12 mm) and of adequate length (between 38 and 42 cm) was implanted manually. The nail was inserted, keeping the proximal holes of the nail parallel to the femoral neck. Two parallel guide wires were passed into the femoral neck such

that inferior guide wire was placed just above the calcar deep in the subchondral bone. Strict parallel placement of guide wires was observed in both AP & Lateral view. Reaming over guide was done by step-drill and lag screw of 8.0 mm and anti-rotation screw of 6.4 mm were introduced. Depending upon the fracture configuration and stability, the distal static and dynamic locking was done.

All patients received prophylactic antibiotic doses and postoperative thromboprophylaxis. Non weight bearing physiotherapy was started from first postoperative day. Clinical and radiological assessments were done during follow ups at 2 weeks, 6 weeks, 3 months, 6 months, 9 months and 1 year Patients were allowed to bear weight from 4 to 6 weeks depending on postoperative serial X rays.

Fig 1 — Pre-op and post op radiograph showing Long PFN in reverse oblique intertrochanteric fracture

Results

Clinical and functional outcomes were assessed according to Harris hip score. Out of 30 cases, 24 patients had a good outcome, 5 patients had fair outcome and 1 patient had poor outcome due to difficulty in squatting and sitting cross-legged. Radiologically all fractures were united. Average fractureunion time was 16 weeks (12-20 weeks). Delayed union was observed in two patients. There was no case of non-union or AVN of femoral head. Two patients had Cut out/Z effect without loss of reduction and 1 patient had Cut out/Z effect with loss of reduction (varus malalignment). The later case was managed by implant removal, deformity correction, bone grafting and DCS plating. Reverse Z effect was seen in 1 case but it did not affect the functions of patient. Only 1 patient of reverse oblique trochanteric fracture had shortening >2 cm who was managed by shoe raise. None of the patients had implant breakage. Postoperatively, 2 patients developed superficial wound infection, one in either group which were resolved with change in injectable antibiotics according to culture sensitivity.

Discussion

Fractures of the proximal femur are challenging injuries for the orthopaedics surgeon. There are mainly two types of internal fixation- extramedullary and intramedullary devices. Initially extramedullary device, namely Sliding Hip Screw (SHS) was used widely for peritrochenteric fracture management. However, studies have reported that these load bearing implants are inappropriate for these unstable fractures as they tend to fail under strong stresses resulting from bending movements and compressive forces generated by body weight[2,7]. Moreover, they require larger surgical exposure leading to more blood loss and more chances of wound infection[8]. On the contrary intramedullary implants, being load sharing, are placed close to the mechanical axis and are considered biomechanically more stable than extramedullary implants. They also facilitate early mobilization and require less surgical exposure leading to less blood loos, less chances of wound infection and short operating time[2,3,7]. In the range of intramedullary implants, initially, reconstruction nails were used. But, it has an entry portal through piriformis fossa which is much more difficult than that through the tip of trochanter[3]. There also exists the risk of split fracture of the femoral neck and damage to blood supply of femoral head during the process of entry hole making, reaming, and nail insertion through the fossa piriformis fossa[7]. To avoid these complications proximal femoral nail was introduced by AO/ASIF in1997[2]. It has entry portal through tip of greater trochanter and has following advantages– (i) provision of anti rotation screw along with lagscrew proximally, (ii) variable length which can span fracture,(iii) fluting tip reducing the possibility of fracture below the tip of nail and (iv) small valgus angle[3]. But short proximal femoral nail has increased chances of shaft femur fracture distal to nail as there is abrupt change in stiffness of construct. This disadvantage of short PFN was overcome by long PFN where femur fracture distal to nail was avoided. But, there are certain points which need to be emphasized about long proximal femoral nail –(i) prior to nail insertion anatomical reduction is mandatory (ii) proper entry portal through tip of greater trochanter[3,8]. If entry is too lateral – it can cause splintering of lateral cortex & implant failure[12]. On the other hand, if entry point shifted medially, the awl might slip into the pyriformis fossa and damage blood supply to femoral headleading to a vascular necrosis of femoral head[7].Thus considering results from our series-

long proximal femoral nail can be considered as reliable implant for fixation of subtrochanteric & reverse oblique fractures. However, our series do have limitations like small sample size, short follow up period of one year, lack of comparison group.

Conclusion

Long proximal femoral nail can be considered as reliable implant for subtrochanteric & reverse oblique fractures.However proper fracture reduction and correct entry point is the key for successful outcome.

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(Continued from page 15)

Range of movements of wrist joint: 15 points–mild stiffness–5 points, moderate stiffness–10 points and severe stiffness–15 points.

Muscle power of muscles acting at wrist joint : 15 points. 3 points for loss of one grade of muscle power (3x5=15).

One point for deformity of each shoulder, elbow and wrist totalling 3 points.

One point for each inch of shortening of upper limb up to 7 inches totalling 7 points.

Thus the total 100 points allotted to each upper limb for 100% disability.

Permanent Disability Evaluation of Spine :

100% or 100 points allotted to the spine are divided as follows :

Range of movements of cervical spine : 30 points–mild stiffness–10 points, moderate stiffness–20 points and severe stiffness–30 points.

Range of movements of lumbar spine : 30 points–mild stiffness–10 points, moderate stiffness–20 points and severe stiffness–30 points.

Muscle power of muscle acting on cervical spine : 15 points. Loss of one grade of muscle power is allotted 3 points (3X5=15).

Muscle power of muscles acting on lumbar spine : 15 points. Loss of one grade of muscle power is allotted 3 points.

Deformity of scoliosis, kyphosis and lordosis: 10 points – mild deformity-3 points, moderate deformity–6 points and severe deformity–10 points.

Thus the total 100 points allotted for spine for 100% disability.

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Original Article

Acute Exposure Myositis of the upper trapezius

Rezina Banu[1], Priyajit Chattopadhyay[2], Rajeev Raman[3], Arindam Basu[4]

Acute inflammation of the upper trapezius is a common seasonal condition observed during the change of seasons in some of the tropical countries. The condition appears to be an acute, non-infective exposure myositis of the trapezius muscle due to exposure to sudden cold air. The important causal factors are extreme variations in the day and night temperature by more than double and exposure of the shoulder area to cold air. A ten year study of 150 adult patients in the age group of 15 to35 years is presented. The condition is more common in females and resolves within 2-3 days with anti-inflammatory drugs. The pathophysiology of acute exposure myositis appears to be a reflex vasoconstriction phenomenon occurring in the area of the upper trapezius. All patients responded well to the treatment and the pain completely disappeared within 2 to 3 days. The range of painless movement of the neck improved rapidly and was full by the 3rd day. Follow up was from six months to 1 year. In upper trapezius, the vasoconstriction occurs in the angiosome of the muscle which includes the skin over the shoulder, including the choke vessels, giving rise to exposure myositis. The condition is self-limiting and does not have long-term consequences.

[*J Indian Med Assoc* 2019; **117(10)**: 23-4]

Key words **: Trapezius, Myositis, Coldexposure, Angiosome.**

Cold weather related problems in the limbs like frostbite and chilblains are well established entities. Wide (natural or manmade) variations in the day and night temperatures are found to be causing orthopaedic problems, though of a much lesser severity. When the minimum and maximum atmospheric temperatures vary by more than double during the change of season in the tropical weather, the day temperatures are on the warmer side, calling for use of artificial cooling indoors while the night temperatures are much colder. Acute pain in the area of upper trapezius is seen in young patients during this change of seasons. A ten-year study (from March 2000 to October 2010) is presented that includes analysis of 150 adult patients who had at least one episode of this condition during the change of season. The single most contributory factor was the exposure to cold air when the difference in the maximum and minimum temperatures was double the figures.

Material and Methods

One hundred and fifty patients in the age group of 15 to35 years were studied for acute, weather related pain in the shoulder area that developed overnight. All the patients were otherwise healthy individuals with no previous problem, either systemic or locally related to the shoulder and the cervical spine. The age group distribution is shown in Table 1.

The clinical presentation in all the cases was typically the same. The patient woke up with an acute pain and stiffness on one side of the neck, ipsilateral shoulder and interscapular area. There was a significant history of sudden exposure to cold air either in the form of riding a motorbike wearing an open collar outfit, sleeping or prolonged sitting directly in front of an air conditioner or a desert cooler outlet or even a high speed sealing fan with the shoulder area exposed, the day or night before. The right shoulder was more commonly affected than the left (R-97, L-53). No patient had bilateral involvement simultaneously. The most significant complaint was inability to turn the head to the affected side in looking backwards. There were no systemic signs of inflammation like fever. The affected area did not show any erythema or swelling. The neck was held in a position of tilt towards the affected side in the position of torticolls. There was acute tenderness on palpation of the upper trapezius upto the insertion in the acromion process. Passive turning of the neck to the affected side was painful. Other neck movements were minimally painful but not restricted. The ipsilateral shoulder was unaffected in its range of movements. There was no neurovascular deficit.

The diagnosis of this condition was made on the basis

Table 1 — *Frequency distribution according to age and sex (n=150)*

Age Group	Males (%)	Females (%)	Total (%)
15-25	32(21.33%)	36(24%)	68(45.33%)
25-35	34(22.67%)	48(32%)	82(54.67%)
TOTAL	66(44%)	84(56%)	150(100%)

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of the typical history and clinical findings alone.

All patients were treated with oral analgesic (Ibuprofen 400 mgm tid or diclofenac sodium 50 mgm bid or nimesulide 100 mgm od) for 3 days, local heat in the form of hot packs or dry heat and protecting the part from exposure to cold by keeping the area covered with warm clothing.

Results

All patients responded well to the treatment and the pain completely disappeared within 2 to 3 days. The range of painless movement of the neck improved rapidly and was full by the 3rd day. Follow up was from six months to 1 year. Eighty-seven patients (58%)showed a tendency for recurrent attacks at the change of season almost every year and this group was dominated by the male population, (40 out of 66 cases, 60 % of males) while only 20 out of 84 (17 %) females showed tendency for recurrent attacks. There were no local long-term effects of the condition.

Discussion

Acute exposure myositis of the upper trapezius is an entity specifically related to the change of weather. It is observed specifically during the change of either summer to winter or winter to summer. The condition was seen occasionally during mid summer, when strong air conditioning was used at night and the day temperatures were as high as 40 degree Celsius. It was practically not seen during acute winter when the body was well covered with thick clothing or during the rainy season. The dominant extremity was commonly affected.

The pathology of acute exposure myositis appears to be a reflex vasoconstriction phenomenon occurring in the area of the upper trapezius. The skin overlying this large muscle gets cold due to exposure to cold wind leading vasoconstriction in the skin and the underlying muscle fibres, possibly along with minimal or no capillary wall damage. There appear to be two anatomical factors contributing to this phenomenon. Taylor and Palmer[1] described as an entity called 'choke vessels'. These are arteries or arterioles of sometimes constant but more often reduced calibre that span the boundaries of the adjacent territories of the main and the accessory blood vessels supplying a muscle. The upper part of trapezius is supplied by the superficial cervical artery. An additional supply to the lateral part of the muscle comes from the acromial branch of the suprascapular artery[2]. The two arteries ramify in the muscle; Trapezius probably has 'choke vessels' between the territories of these two vessels. The other anatomical fact pertains to the concept of 'angiosomes'. These are composite blocks of tissues supplied by named distributing arteries and drained by their corresponding veins. Where a muscle underlies the integument, vessels bridge the two tissues. These may be primarily cutaneous vessels supplying the skin directly, contributing small branches to the muscle as they pass through it or they may be the terminal branches of intramuscular vessels, which perforate the muscle to supplement the blood supply to the skin. The correspondence between the vascular territory in the skin and the underlying tissues has given rise to the concept of angiosomes. Correlating these two facts for upper trapezius, the vasoconstriction occurs in the angiosome of the muscle which includes the skin over the shoulder, including the choke vessels, giving rise to exposure myositis.

Cold injury to the mammalian tissues begins when the tissue temperature reaches 10°C [3]. At –5°C, cells lose the ability to recover from the cold induced damage. Factors affecting the phenomenon adversely are humidity and wind. Dessert coolers that use water circulation for cooling can increase the humidity, while other modes do not have the humidity factor. Wind accelerates the heat loss and disrupts the radiant heat around the body, leading to vasoconstriction and a low-grade vasculitis, which is quickly reversible. There is no damage to the capillary endothelium; hence no tissue oedema is observed. The injury is much less severe than even a first-degree frostbite; the damage is minimal and quickly reversible. The large size of the muscle (purely muscular in this area) and its predisposition for remaining exposed makes it vulnerable to exposure myositis[4]. Female predominance can be attributed to the collarless local outfit customs. The fact that the condition quickly subsides by application of warmth also points to it being caused by exposure to cold. It appears that the absolute size of the muscle also matters as seen in adolescents who are of larger frames than their peers. The youngest age of the patient in our study was 16 years. However, the predominantly unilateral affection is not understood clearly. The condition has been described as a cause of stiff neck along with other causes like degenerative cervical discs, infections of the cervical spine and neuritis of the nerves in the neck area without any clear description of the pathophysiology. The condition is self-limiting and does not have long-term consequences.

The condition is probably restricted to the geographical areas experiencing extremes of weather. There are no permanent or long-term consequences of this condition.

Acknowledgement

We thank Prof. Vikram Marwah, FRCS, Ex-Dean and Professor, Department of Surgery, Government Medical College, Nagpur, & Prof Shobha Arora Prof &HOD, AIIMS, Rishhikesh India for permitting the expansion of his original concepts on the subject.

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Original Article

Outcome of different treatment modalities in old Ankle Injuries

Abhishek Chakraborty[1], Amit Kumar Ranjan[2], Prasun Sanyal[3], Saurav Ghosh[4]

Ankle fractures are the most common form of fractures treated by orthopaedic surgeons. In this study we evaluated the results of late operative treatment of displaced ankle fractures. In our series, 30 patients were operated, followed up and their results were evaluated. Among them 17 patients had WEBER Type B injury (56.67%) followed by WEBER Type C (26.67%) and WEBER Type A (16.67%). Most of the cases (60%) were operated within 3-6 weeks. In most of the cases (27 cases,90%) osteosynthesis was done and in only 3 cases(10%) ankle arthrodesis was done. More than half patients(17,56.67%) were followed up for 13-18 months,40% patients were followed up for 7-12 months and only one patient was followed up for 6 months. Scoring with AOFAS(American Orthopaedic Foot and Ankle Society's Ankle-Hindfoot Scale) score, at presentation the average AOFAS Score was 27.73, at 3 month postoperative it was 67.63 and at 6 months postoperative the score average was 83.33.They were all returned to their pre injury activities. In our study,we have seen that osteosynthesis is the mainstay of treatment because correction of malalignment lead to a better stance, better muscle balance and gradual correction of any foot deformities. Ankle arthrodesis is preferred as the primary procedure if extensive arthritic changes are present, there is associated old unreduced dislocations or if extensive corrective surgery will be required. In the Indian scenario, ankle arthrodesis may be preferred in manual labourers as it offers stable painfree ankle in a single procedure.

[*J Indian Med Assoc* 2019; **117(10):** 25-8]

Key words **: Ankle fracture, Osteosynthesis, Arthrodesis, AOFAS Score.**

Ankle fractures are considered as one of the most common fractures treated in the hospital. The overall estimated incidence of ankle fractures is approximately 100 fractures per 105 person-years[1,2]. This rate has constantly been increasing in both active young patients and in the elderly over past several decades[3].

We face a lot of cases of old, undiagnosed, neglected ankle injuries in our hospital.

Our goal is to achieve satisfactory functional recovery after judicious management of old neglected ankle injuries considering its various limitations and complications.

Our objectives are to attain painless, stable, mobile ankle joint, to attain the acceptable appearance of foot and ankle and to attain long-lasting functional improvement.

Materials and Methods

This study was conducted in the department of orthopaedics, Institute of Post Graduate Medical Education & Research and SSKM Hospital, Kolkata-700020, from December 2011 to October 2013. In this prospective randomized study, 30 patients were taken into consideration. All the patients were followed up for at least 6 months (6 to 18 months).

We operated on the patients of old (>3 weeks) ankle injuries with pain, functional disability and deformity and assessed the AOFAS score at presentation.

The patients' age, sex, occupation, mode of injury, type of injury were taken into consideration. The average age of our study population was 34.03 years. The majority was male 22(73.33%), and 8(26.67%) were female. We have included the cases of age more than 18 years , ankle injury of more than 3 weeks duration, closed injuries and patient medically stable for the operative procedure. We have excluded the cases of open injuries of ankle, patients suffering from neuropathy, medically debilitated patients, patients with uncontrolled Diabetes mellitus and patients with peripheral vascular disease.

After a detailed history and thorough clinical examination, radiographs were taken in AP, Lateral and Mortise view showing the ankle and injury is classified using Danis Weber classification.

This system classifies ankle fractures into three groups, A, B, and C, on the basis of the level of the fibula fracture in relation to the tibial plafond[4].

Then all the patients are assessed by AOFAS (American

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Orthopaedic Foot and Ankle Society's ankle-hindfoot scale) score and were recorded.

Then Pre-operative anaesthetic assessment and counselling of the patients regarding procedure, advantages, disadvantages, complications and prognosis were done and put for operation. Pre-operative antibiotics (Inj. Cefuroxime 1.5 gm and Inj. Amikacin 500 mg) were given IV, 12 hours before operation, during operation and post operative 5 days and then shifted to oral Cefuroxime 500 mg for 5 days more.

Analysis and Results

This study was conducted in the department of orthopaedics, Institute of Postgraduate Medical Education & Research and SSKM Hospital, Kolkata-700020, from December 2011 to October 2013.In this prospective randomized study, 30 patients were taken into consideration. Among them 22(73.33%) were male and 8(26.67%) were female. All the patients were followed up at least 6 months. We operated on the patients of old (≥3 weeks) ankle injuries with pain and functional disability (American Orthopaedic Foot and Ankle Society's (AOFAS) Ankle-hindfoot Scale >60) who had significant trauma predisposing to the fracture.

The average age of affected males was 34.68 years and females were 32.25 years. The male: female ratio was 2.75: 1.

Most common injuries are WEBER Type B fractures (56.67%) followed by WEBER Type C (26.67%) and WEBER Type A (16.67%).

Most of the cases (60%) were operated within 3-6 weeks. Only 4 cases were operated after 10 weeks. Most of the cases (27 cases, 90%) osteosynthesis was done and in only 3 cases (10%) ankle arthrodesis was done. More than half of the patients (17,56.67%) were followed up for 13-18 months, 40% patients were followed up for 7-12 months and only one patient was followed up for 6 months. We faced complications like infection in three cases and skin loss in two cases which needed plastic surgery. At presentation the average AOFAS Score was 27.73, at 3 month postoperative it was 67.63 and at 6 months post op the score average was 83.33.

Discussion

In our study, we selected our patients by preoperative evaluation including history, clinical examination and radiographs of the affected portion. Injury is classified according to WEBER's classification and evaluation of AOFAS score was done preoperatively.

In our series, 30 patients were operated, followed up and their results were evaluated. There was male predominance (68% male, 32% female). Male female ratio was 2.75: 1. Average age at operation was 34.03 year (21-55 years). Edward Yang *et al*, in a study in 2011 had taken 43 patients with supination-external rotation injury of ankle. Out of 43, 23 were male and 20 were female and the average age was 42 years[6]. Maged M Mostafa *et al* had studied on surgical management of neglected fracture dislocation of ankle. In their study out of 16 patients 14 were men and 2 were women and average age was 40 years[7].

In our series, 17 patients had WEBER Type B injury (56.67%) followed by WEBER Type C (26.67%) and WEBER Type A (16.67%).In another study by Maged M Mostafa, MD and Hasan M Ali, MD in Egypt out of 16 patients, 8 had type B, 2 had type A, 6 had type C injuries[7]. So, the injury pattern observed in our study is comparable to their study.

Most of the patients (60%) presented within 3 to 6 weeks of injury, 26.67% presented within 6 to 10 weeks of injury and only 4 patients presented after 10 weeks of injury. Average delay in the presentation was 1.71 months. In a study by Maged M Mostafa, MD and Hasan M Ali, MD the average delay in the presentation was 2.2 months[7].

In our series, we preferred osteosynthesis as the operation of choice to restore the normal ankle anatomy and function. In 90% patients were treated with osteosynthesis. Fibula was fixed with 1/3rd tubular plate or recon plate and screws. In one case, both the malleoli fixed with TBW. Medial malleolus was fixed with 4 mm cannulated cancellous screw (Figs A-F) (20 cases) or tension band wiring (7 cases). In another case one syndesmotic screw is used along with both malleoli fixation. 3 patients in our study had severe osteoarthiritic changes in bones around ankle joint due to malunited bimalleolar fracture with talar tilt preoperatively. So, we chose Ankle Athrodesis in those cases using Calandruccio clamps (Figs G-L).

Kaj TA Lambers *et al* had done a study in 2013 on long term outcome of pronation external rotation ankle fractures treated with syndesmotic screws and arthrodesis. Out of 50 patients,they had done ORIF in 48 patients and arthrodesis in 2 patients who had severe arthritic changes[8]. In another study done by B S Narayana Gowda et al 15 patients were taken into consideration with post traumatic arthritis.They had opted Charnley's Compression Device for arthrodesis[9].

In our study, more than half patients (56.67%) were followed up for 13 to 18 months, 40% for 7 to 12 months and only one female patient was followed up for 6 months. Average period for follow up was 12.73 months. In other studies in this field in different parts of the world follow up period were longer. Maged M Mostafa, MD and Hasan M Ali, MD had done a study in Assiut University, Assiut, Egypt in 2011 and average follow up period was 5.5 years. B S Narayana Gowda, J Mohan Kumar *et al*; had done a study in 2012 on outcome of ankle arthrodesis in post traumatic arthritis and the average follow up period was 1-5.7 years. Because of the short span of the study our follow up period is less. A longer follow up is necessary.

In our series, 5 patients (3 male 2 female) had post operative complications of which 3 patients (10%) had infection and 2 patients had post operative skin loss over operative area. Infections were treated with IV broad

Case 1

Fig A & B — Pre-operative clinical picture showing marked deformity

Fig E — 6 Month Postoperative X-ray of ankle AP & Lateral view (Fracture united)

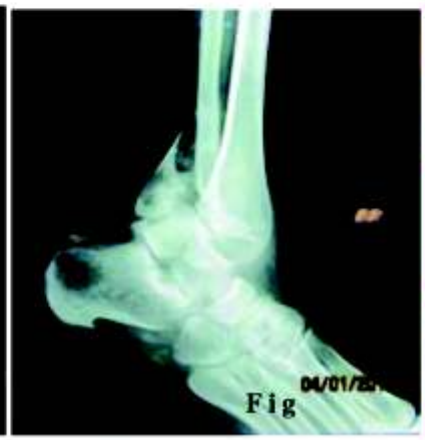

Fig C & D — Pre-operative X-RAY of ankle AP & lateral view

Fig F — Postoperative clinical photograph showing correction of the deformity

spectrum antibiotics and regular dressing. Skin loss was managed by Split Thickness Skin Grafting. We observed that skin loss occurred in patients of older age group. No other complications like non-union, neurovascular injury, DVT, implant failure were occurred in our study.

All the patients were evaluated with AOFAS score pre operatively and at 3 months interval postoperatively. At presentation, average score was 27.73 which was improved post operatively. Average 3 months follow up score was 67.73 & average 6 month follow up score was 83.33. At presentation all patients having AOFAS score below 60. Among them 13 had score below 30 & 17 had score 30-60. At 3 month follow up only 3 patients had score below 60. Among them 2 patients had post- op complication like skin loss. Rest 27 patients had score between 60-80. At 6 months interval 23 patients (76.67%) had score above 80 and only 7 patients (33.33%) had score between 60-80. Among them 5 patients had post op complications. Our results are comparable with other studies done by B S Narayana Gowda, *et al*[9]; EM Van Schie-Van der Weert *et al*[11]; Jung Ho Noh *et al*[12].

The authors of AOFAS scale preferred not to correlate numeric values to Excellent, Good, Fair & Poor because they cannot identify which criterion was used for providing the overall grade, and these names could give rise to confused results[13].

So, results were not categorized as excellent, good, fair & poor. But we could have an idea about the improvement of scores which was indicative of functional improvement of patients.

The limitation of our study is that we don't have a large patient number and a long follow up. The study would have been more analysing, if we could have compared it with other modes of management. In our study, we concentrate on old bony injuries only but soft tissue injuries are not evaluated thoroughly.

Improvement of pain & functional capabilities that were found at 3 months were improved at 18 months (max F/U) which is comparable with other workers' experience. Most studies done in this topic had used AOFAS score to assess result like we did.

Conclusion

In Indian scenario, it is not uncommon to see patients treated conservatively or even left untreated and presented with displaced ankle fractures several weeks after injury.

In our study, we have seen that osteosynthesis is the mainstay of treatment because correction of malalignment lead to a better stance, better muscle balance and gradual correction of any foot deformities.

Ankle arthrodesis is preferred as the primary procedure if extensive arthritic changes are present or there is

Case 2

Fig G — Pre-operative clinical photograph

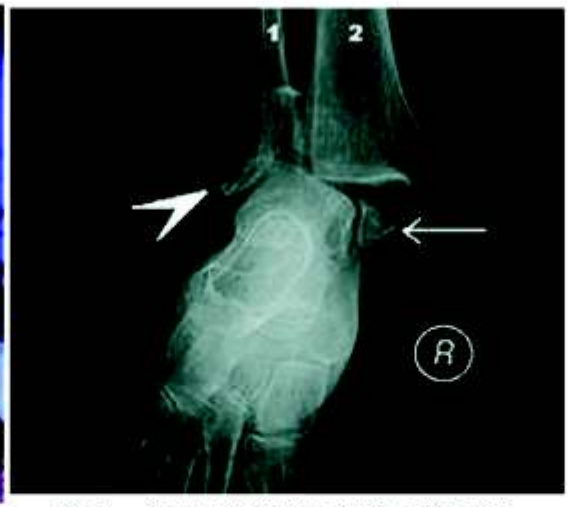

Fig H — Pre-operative X-Ray showing TYPE B # (WEBER) with severe OA

Fig I — Calandruccio clamp

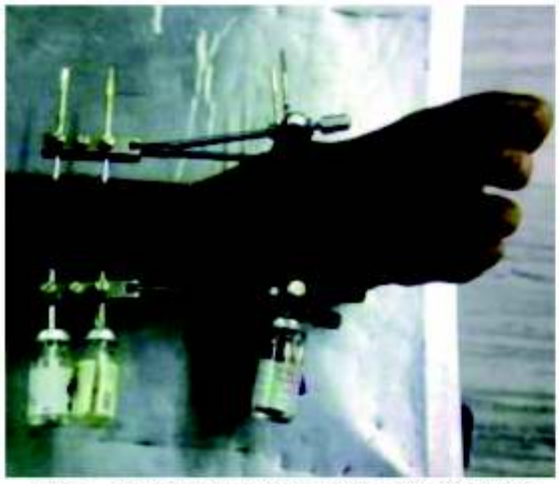

Fig J — Postoperative photograph of ankle arthrodesis

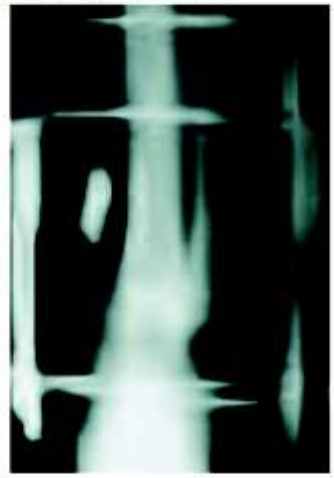

Fig K — Postoperative X-Ray

Fig L — 6 month follow-up.

associated old unreduced dislocations or if extensive corrective surgery will be required.

At the longest followup (18 months), patients were generally doing well with most experiencing little or mild pain & few restrictions in functional activities. They had a significant improvement in function over time. It is important to counsel patients & their families regarding their expected functional recovery after an ankle injury.

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Original Article

Role of Ilizarov Fixator as early definitive management of Bicondylar Tibial Fractures

Priyajit Chattopadhyay[1], Debajyoti Sarkar[2], Kiran Kumar Mukhopadhyay[3], Paras Kumar Banka[4], Arumoy Bhuimali[5]

The tibial plateau fractures had been one of the periarticular fractures with the suboptimal outcome even with the best treatment modalities. Open reduction and locking plate fixation even though being the gold standard of treatment are met with severe soft tissue complications. External fixation using fine wires and circular fixator has the advantage of closed reduction, minimal soft tissue stripping and angular stability. We studied the outcome of tibial plateau fractures treated with Ilizarov fixator in our institute.Fifteen patients with mean age of 39.87yearswere undertaken for the study. All the fractures united with the mean union time of 14.3 weeks. At the final follow up outcome was assessed using the ASAMI Score which was found to be excellent in 11cases (73%), good in 3 cases (20%) fair in 1case (6%) with no poor outcomes. It can be concluded that circular external fixator can safely be used for early definitive management of bicondylar tibial fractures.

[*J Indian Med Assoc* 2019; **117(10):** 29-32]

Key words **: Bicondylar Tibial Fracture, Ilizarov Fixator.**

The tibial plateau fractures had been one of the periarticular fractures with the suboptimal outcome even with the best treatment modalities. This is attributed to the periarticular location, high energy trauma and soft tissue compromise. The prevalence of tibial plateau fracture is around 1-2% of all long bone fractures[1] among which many are open and also have concomitant injuries like meniscal injuries, cruciate and collateral ligaments injuries, compartment syndrome and distal femoral fractures[2]. The tibial plateau fractures have bimodal age distribution with high energy trauma being the cause in younger age and low energy in the elderly. Schatzker et al. classified it in 1979, and it is the most commonly used classification[3]. Schatzker type V and VI are bicondylar fractures and have worse outcomes.

The treatment aims to obtain a stable, aligned, painless mobile joint and prevent post-traumatic osteoarthritis[4]. It is achieved through the principles of anatomical reduction of articular segment and restoration of length and mechanical axes. Open reduction and fixation with locking plates are most commonly followed surgical modalities and provides a stable construct. This treatment modality has the inherent disadvantage of excessive soft tissue dissection, which often results in complications such as skin necrosis, infection, hardware prominence and knee stiffness.

External fixator has been used in open fractures and fractures with compromised soft tissue status to allow the soft tissue to heal as a part of "span, scan, fix" concept[1]. External fixation using fine wires and circular fixator has the advantage of closed reduction, minimal soft tissue stripping and angular stability. We studied the outcome of tibial plateau fractures treated with Ilizarov fixator in our institute.

Materials and Method

This study was conducted in a tertiary care institution where 15 tibial plateau fractures treated with Ilizarov technique between 2014 to 2018 were evaluated for outcome analysis using the Association for the Study and Application of the Method of Ilizarov (ASAMI) scoring system[5] (Table 1).

Inclusion and Exclusion Criteria :

Inclusion criteria included skeletally mature patients with Schatzker type V and VI tibial plateau fractures treated with Ilizarov external fixator and a minimum follow up of 6 months.

Patients with following were excluded from the study: concomitant bony injury in ipsilateral or contralateral lower

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limbs, pathologic fractures, any neurological or muscular conditions which impair rehabilitation.

Operative Technique :

All cases were executed under spinal anaesthesia in the supine position. The fracture was reduced by manual traction, pointed reduction forceps and using the cortical window as necessary to get a congruous joint surface under image intensifier. A three ring Ilizarov construct was applied in all cases. The first ring parallel and one tsun below the knee joint line, the second ring distal to the fracture and the third ring above the ankle. Olive wires from opposite directions were passed to approximate the tibial condyles and were fixed to the first ring after tensioning using dynamometer. Basic principles of Ilizarov technique such as passing wires through safe zones and adequate divergence were followed. The rings were fixed to each other using connecting rods, maintaining the axes and joint angles.

Departmental protocol for antibiotics and postoperative analgesia was followed. Check X-rays were taken, and necessary adjustment in the fixator construct was carried out to correct any residual malalignment. The patients were started on a gradual range of motion exercises of knee and ankle and non-weight bearing crutch walking from the second post-operative day. The weight bearing was increased progressively as tolerated by the patient. Wounds were managed as per the needs. Patients were trained on pin tract care. After the healing of soft tissue injuries, patients were discharged and followed up at two weekly intervals. Follow up radiographs were taken as needed. After clinico-radiological evidence of healing, the frame was dynamized. Painless full weight bearing with dynamized fixator was taken as criteria for frame removal. The patients were assessed at final follow up using the ASAMI score.

Table 1 — *ASAMI Scoring System*

Variables	Score
Bone Results :	
Union without infection	30
Nonunion or infection	0
Radiologic results :	
Good joint line	10
Malalignment <2 mm	8
Malalignment 2–4 mm	6
Malalignment >4 mm	0
Knee range of motion :	
>130 degrees	10
110 degrees–130 degrees	8
80 degrees–109 degrees	6
<80 degrees	4
Leg length discrepancy :	
No leg discrepancy	10
<1 cm	8
1–2 cm	6
2–4 cm	3
>4 cm	1
Pain :	
Absent	10
After sport activity	9
After long walking	8
Weather related only	7
After short walking	4
Mild activity related	2
Night pain at rest	1
Sporting activity :	
Full return to previous sport activity	10
Decreased sport performance	8
Poor sport performance	4
No sport ability	0
Subjective patient satisfaction :	
Full satisfaction	10
Mild dissatisfaction	8
Medium dissatisfaction	4
Dissatisfaction	0

Excellent: score = 80–90; good score = 70–79; fair score = 59–69; poor score <59

Results

Fifteen patients (11 male, 4 female) with a mean age of 39.87 years (range 24-58 years) were undertaken for the study. The mean follows up duration was 18.6 months (range 6-34 months). The mean injury to surgery interval was 4.3 days, and the fixator removal was done at an average of 13.2 weeks (range 10-16weeks). All the fractures united with the mean union time of 14.3 weeks. The average duration of full weight bearing was 16.47 weeks

Table 2 — *Analysis of Outcome and Results*

Age	Sex	Schatzker Type	Open/ Close	Injury Surgery Interval (in days)	Fixator Removal (in weeks)	Union Time (in weeks)	Full Weight bearing (in weeks)	Follow up duration (in months)	Arc of Motion (in degrees)	ASAMI Score	Outcome	Complications
58	F	V	Open	4	14	15	17	34	120	79	Good	pin tract infection
45	F	VI	Close	6	12	14	16	23	130	84	Excellent	
42	M	V	Close	2	13	14	16	23	120	85	Excellent	pin tract infection
24	M	VI	Close	3	15	15	17	29	150	88	Excellent	
32	F	VI	Close	4	14	16	18	21	140	83	Excellent	pin tract infection
28	M	V	Open	7	15	15	17	30	130	81	Excellent	
32	M	VI	Close	3	13	15	17	12	150	83	Excellent	
24	M	VI	Close	2	16	16	18	18	160	86	Excellent	pin tract infection
49	M	VI	Close	5	14	13	15	9	130	82	Excellent	
56	M	V	Close	10	12	13	18	6	120	75	Good	pin tract infection
44	M	V	Close	3	13	15	16	18	150	78	Good	
27	M	V	Close	2	10	10	12	10	130	82	Excellent	pin tract infection
55	M	VI	Open	5	14	16	18	17	100	62	Fair	pin tract infection
24	M	VI	Close	3	12	15	17	14	160	84	Excellent	pin tract infection
58	F	V	Close	6	11	13	15	15	130	86	Excellent	

(range 12-18 weeks) (Table 2).

Superficial pin tract infection was observed in 8 cases which resolved with aggressive pin tract care and oral antibiotics. Two cases needed retensioning of loose wires. There was no deep infection, such as septic arthritis or osteomyelitis. Iatrogenic neurovascular injuries were not observed in any of the cases. There was no equinus deformity.

Fig 2 — Postoperative X-rays and Clinical picture

At the end of 6 months, all patients had knee motion in the range of more than 120 degrees except one where it was 100 degrees.

At the final follow up outcome was assessed using the ASAMI Score which was found to be excellent in 11 cases (73%), good in 3 cases (20%) fair in 1case (6%) with no poor outcomes.

Discussion

Irrespective of the technique, treatment of tibial plateau fractures is aimed at joint congruity and restoration of axes. Open reduction and internal fixation with locking plates have been the gold standard in achieving this. However, due to the subcutaneous location and associated soft tissue injury, this treatment modality is met with some severe wound-related complications such as wound dehiscence, implant prominence and flap necrosis. Owing to the extensive dissection of already compromised soft tissue and periosteal stripping, the biology is disturbed significantly increasing the risk of infection and non-union.

Circular external fixator has been used to treat such fractures since long and have shown promising outcomes[4-7].

The average time interval for the union was 13.2 weeks in our study. The similar duration was reported by Dendrinos *et al*[6] (14.4 weeks), and Pirwani *et al*[8](14.6 weeks). All 15 fractures united in our study. Similar reports have been mentioned in the study of 46 cases by Ferreira *et al*[9] with mean union time of 3.9 months. Non-unions commonly reported with internal fixation in proximal tibia are rare with this technique owing to the preservation of biology. Bove *et al*[10] in their comparative study have reported one case non-union with the circular fixator.

Fig 1 — Pre-operative X-rays

Fig 3 — X-rays after fixator removal

The mean injury to surgery interval in our study was 4.3 days (range 2-10days). Healing of soft tissue takes days and even weeks in tibial plateau fractures leading to delay in internal fixation[1]. This problem is not encountered if Ilizarov fixator is used as definitive fixation.

The average duration for fixator removal was found to be 13.2 weeks. The duration to return to preinjury level was 16.4 weeks (range 12-18 weeks). Debnath *et al*[11] reported this to be 17.4 weeks, and in the study by McKee *et al*[12], the duration of fixator removal was reported as 16 weeks.

Owing to the biomechanical properties of Ilizarov fixator, the patients are started on early weight-bearing, which is not done with the use of internal fixation. Axial micromotion allowed by Ilizarov fixator also has a positive impact on healing. Due to less soft tissue, dissection mobilisation exercises are relatively pain-free as compared to internal fixation. In terms of the range of knee after the surgery, we have found a minimum range of 120 degrees in 14 cases

and around 100 degrees in one open fracture.

The outcomes measured in terms of ASAMI Score was found to be excellent to good in 93% of cases with no poor outcomes. Catagni *et al*[5] in their study of hybrid Ilizarov fixator for tibial plateau reported 96% excellent and good results. Outcomes, as measured with other scoring system, has also been comparable. El-Gafary K *et al*[13] reported 76.7 % good to excellent results using the Knee Society Score. Debnath *et al*[11] reported excellent to a good outcome in 96.7% of cases using the Honkonen & Jarvinen criteria[14]. Singh H *et al*[15] reported 85% excellent or good functional result at a mean 24 weeks follow-up.

Fig 4 — Knee motion after removal of fixator

Several comparative studies are comparing internal fixation with circular external fixators and have reported similar outcomes in both treatment modalities. Hall *et al*[16] reported a shorter hospital stay and a marginally faster return of function. Bove *et al*[10] have reported a reduced risk of infection, early mobilization, restoration of the normal lower extremity alignment, versatility, and improved union rate in patients with multiple traumatic injuries, infection, and soft tissue injuries.

This study is limited by its sample size and lack of comparison with plate fixation. Further elaborate studies are warranted.

Conclusion :

Circular external fixator has shown promising results in term of clinical, functional and radiological parameters as an early definitive management of bicondylar proximal tibial fractures and has less soft tissue complications.

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Original Article

The outcome of Extra-articular Distal Humerus Fracture treated with Pre-contoured Lateral Column Metaphyseal Plate

Partha Sarathi Sarkar[1], Amit Kumar Ranjan[2], Hibjul Ali Khan[3], Partha Pratim Chakraborty[4]

Extra-articular humerus fracture is one of commonest fractures in adults. Most often by treated by operative measures because of deforming forces. Between Sept 2014 to Feb 2018, 20 patients with metaphyseal extra-articular distal humerus fractures were treated using the Extra Articular Distal Humerus Plate. At final follow-up, average range of motion of elbow joint was 0°- 120° flexion and 90°/ 80° supination/pronation. Only 4 patients did not regain full extension until final follow-up and had average fixed flexion deformity of 10°. The mean DASH score at 1 year was 18.3.

[*J Indian Med Assoc* 2019; **117(10):** 33-5]

Key words **: Distal Humerus Fracture, Precontoured Plate.**

Extra-articular distal humerus fracture occurs at an anatomical watershed between humerus shaft and intercondylar region. It accounts for approximately16% of humerus fracture[1,2]. Conservative management via cast or functional bracing, though advocated, may not provide adequate stability and acceptable alignment due to periarticular location, small size of the distal fragment, associated comminution and osteoporotic nature of bone in older individuals[3-5]. Moreover, there is an increased chance of varus deformity and joint stiffness in fractures managed conservatively. Hence, the goal of treatment is to achieve stable fixation with correct alignment and to allow early range of movement of elbow and shoulder[6,7]. Standard 4.5 mm narrow dynamic compression plate fails to provide adequate stability in such fracture pattern[8,9]. Dual plating either in an orthogonal or in a parallel fashion is generally accepted for management of such fracture pattern but its application is fraught with dangers of extensive soft tissue stripping and long operating time, which may risk the development of non-union and infections[5,10]. To minimize the surgical duration and soft tissue devitalization, a single pre-contoured, anatomical shaped Extra-articular Distal Humerus Locking Plate (EADHP) is crafted which provide adequate construct stability, and therefore, can allow early range of movement.

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In this retrospective study, we aimed to evaluate the clinical and radiographic results after fixation of fractures of the distal humerus shaft with this single column system.

Materials and Methods

Between Sept 2014 to Feb 2018, 20 patients with metaphyseal extraarticular distal humerus fractures—AO 12 A/B/C and AO 13A —were treated using the EADHP (Table 1). Inclusion criteria for the patients were: fractures of the distal humeral shaft which could not be fixed with conventional LCDCP's with minimum of six/ eight cortices distally, age >18 years, closed fractures of the distal humeral shaft, with or without radial nerve palsy, recent fractures and non-unions. For this study, we used the 3.5 mm EADHP system. It is a "J" shaped plate precontoured for application on posterolateral surface of distal humerus and is available separately for right and left sides. Proximally, the plate has 3.5 mm combi-hole system with locking and nonlocking screw options. Distally, it curves along lateral supracondylar ridge thus avoiding the olecranon fossa and has five locking screw holes angled medially for achieving purchase in trochlea and capitellum. All the patients were operated in lateral decubitus position under general anaesthesia or brachial block; through midline posterior incision and triceps splitting approach extending 4 cm distal to tip of the olecranon. Radial nerve was identified and protected between the long and lateral head

Table 1 — *AO/OTA classification of patients' fractures*

AO/OTA classification	Number (n=20)	Percentage (%)
12A1	4	20
12A2	7	35
12A3	2	10
12B1	1	5
12B2	3	15
12C1	1	5
13A2	2	10

of triceps prior to plate fixation. Lag screw fixation was used in case of wedge or comminuted fractures. Bone grafting required in old or non-union cases. Closure was done in layer over suction drain. Postoperatively, the patients were given a padded dressing and a cc sling; posterior splintage was added only if necessitated by the fixation construct. Gentle passive mobilization of shoulder and elbow was started from first postoperative day, once the pain subsided. Active and assisted range of motion exercise of arm within sling was encouraged within the first week. Patients were followed clinically and radiologically at 2 weeks, 6 weeks, 3 months, 6 months and yearly. Clinically, union (assessed by absence of tenderness on palpation of fracture site), range of motion of elbow joint and functional outcome using Disabilities of the Arm, Shoulder and Hand (DASH) score was assessed for each patient. Radiologically, union was determined by bridging callus over fracture site on at least 3 cortices and the absence of implant loosening or failure (Fig 1).

Fig 1 — Pre-operative and postoperative X-ray of distal humerus fracture treated by EAHDP

Results

It is a retrospective study of 20 patients (male: female 13:7) with extra-articular distal humeral shaft fractures who were operated using the EADHP system from September 2014 to April 2018. Road traffic accident (11 patients) was the most common mode of injury, followed by fall from height (9 patients) and non-union (2 patients). AO/OTA classification of these fractures is given in Table 1. One patient had Type I open wound, 3 patients had associated radial nerve palsy and 7 patients had associated fractures at other sites.18 patients were operated within 5 days of injury, whereas other 2 cases who had non-union following conservative management were operated at around 8 months after injury. The 3 radial nerve palsy patients had continuity of the nerve intra-operatively and all of them showed spontaneous recovery within an average time of 6 months. However, one patient with no neuro deficit developed postoperative radial neurapraxia who gradually recovered within 3 months from date of surgery. Average duration of follow-up was 18 months. The mean time to radiographic fracture union was 12 weeks. At final follow-up, average range of motion of elbow joint was 0°- 120° flexion and 90°/80° supination/pronation. Only 4 patients did not regain full extension until final follow-up and had average fixed flexion deformity of 10°. The mean DASH score at 1 year was 18.3. There were no patients with secondary loss of reduction at the fracture site, non-union, ulnar nerve problems, superficial or deep infection.

Discussion

Open reduction and internal fixation is the treatment of choice for distal humerus fractures. Dual plating either in an orthogonal or in a parallel fashion is generally accepted for management of such fracture pattern but it requires almost circumferential exposure of both the medial and lateral column. Such an enormous soft tissue dissection although is justifiable for intra-articular fractures seems unreasonable for extra-articular shaft fractures[11]. Preservation of soft tissue envelope is important for fracture healing and it has changed the earlier concept of anatomic reduction and rigid fixation[12]. Although, there have been no comparative studies of dual column vs. single column fixation for distal humerus fractures, several studies have suggested higher infection and non-union rates in dual column plating due to greater soft tissue dissection and a longer operative time[5,10]. Standard single column plating techniques fail to achieve adequate stabilization owing to inadequate distal purchase. Moreover, plating over medial aspect of humerus with scanty soft tissue coverage often leads to a high incidence of implant-related complications such as ulnar neuropathy[13] Levy *et al*[14]. used modified Synthes Lateral Tibial Head Buttress Plate (Synthes, Paoli, PA) that allowed for a centrally placed posterior plating of the humeral shaft that angled anatomically along the lateral column to treat far distal humeral shaft fractures[11]. Thus evolved EADHP as an absolute game changer for extra articular distal humerus fractures as it provides stable fixation by minimal soft tissue dissection as well as minimizes complications of dual plating. Additionally, locked plates proved to have improved mechanical stability[15]. Owing to greater screw

hole density distally, EAHDP also allows placement of adequate number of screws in the distal fragment thus improving stability. As compared to trochlea, the posterior aspect of lateral column is non-articular and thus EAHDP is placed without risk of injury to the cartilage or risk of impingement with flexion and extension of elbow[11]. In our series, we have used triceps splitting posterior approach. It can be extended proximally by elevating the triceps off humerus and mobilizing the radial nerve. Distal extension can be accomplished by detaching a thin wafer of bone from the olecranon at the level of triceps insertion[16] or by a distally based tongue muscle flap[17] and exposure can be improved by flexing the elbow and retracting the olecranon posteriorly with reduction forceps, if there is an intra-articular extension of the fracture. This enhanced exposure also provides complete visualization of the radial nerve on both sides of the inter-muscular septum and since it exploits a relatively blood less plane, this approach can be performed without a tourniquet[11].

DASH score was used to assess the functional outcome. This questionnaire asks the patient about symptoms as well as their ability to perform certain activities. It does not matter which hand or arm is used to perform the activity. The mean DASH score at 1 year was 18.3. The normal DASH score in the general population has been reported to be around 10 with a standard deviation of 14.68[18].

Our study also has few limitations viz small sample size and lack of studies to compare the strength between single column vs. double-column locking plate. As EADHP is pre contoured plate, it does not seat equally well in all patients. In such cases bending of plate is required. Caution should be taken so that plate bending is done after blocking the screw holes with locking sleeves and bending the plate only in between the screw holes[11]. More research work must be carried out in plate designing, so that it fits well in Indian population.

Conclusion

The EADHP system using posterior triceps splitting approach is an effective modality for treatment of extra-articular distal humerus fractures as it provides stable fixation with adequate exposure of the radial nerve and posterior surface of humerus yielding satisfactory results and an early return to function.

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Original Article

The clinical and radiological outcome of Percutaneous Pinning in displaced Supracondylar Fracture of the humerus of children

Subhendu Das[1], Sabyasachi Santra[2], Mahboobur Rahman[3], Rajesh Kar[3]

Supracondylar humerus fracture is the most common fracture in the paediatric age group of 4-8 years. It has been treated successfully with closed reduction and internal fixation with K-Wire. These fractures are classified acroding to Gartland classification. Type III and IV fractures were selected for this study. In type III fracture, there is displacement with a posterior hinge, and in type IV fracture, there is a complete loss of anterior and posterior cortical contact. All patients were treated within five days of the injury. The patients were treated by closed reduction and pining with 2 (two) pins laterally or 3 (three) pins laterally or crossed medial and lateral pins randomly. There was no significant difference in fracture stability with three different configurations. Pins were removed after 3 to 4 weeks after surgery following radiological assessment of union. All patients having a full range of movement with any significant deformity of the elbow after six months of follow up. Only two patients were having pin tract infection and three patients having elbow stiffness and one patient developed medial nerve injury. Closed reduction and pining in type III and IV supracondylar fracture is recommended in a paediatric age group to prevent deformity and to restore normal movement of the elbow.

[*J Indian Med Assoc* 2019; **117(10)**: 36-7]

Key words **: Supracondylar fracture, Percutaneous Pinning.**

Supracondylar fracture is typically seen in the paediatric age group, of which 90 % of patients are less than nine years[1]. Most commonly boys are affected[2]. This fracture is 3% of all paedriatic fracture[3]. In type IV fracture, there is a complete loss of anterior and posterior cortical contact of fracture fragment, and it occurs due to high-velocity Trauma. Extension type of fracture is the most common variety. Gartland classified the supracondylar fractures in four types. Type I and Type II are usually treated conservatively. Type III and type IV fractures are inherently unstable variety. These are treated usually with closed reduction and pinning.

Most common displacement of supracondylar fracture that leads to cubitus varus deformity is medial tilt and medial rotation of fracture fragment. So, during closed reduction, these two plane deformity should be corrected and then only pinning can be done.

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Materials and Method

The study was carried at NRS Medical College & Hospital between December 2017 to June 2018. It was a prospective randomized study, where 50 patients with Gartland type III and IV supracondylar fracture were included in this group. All the patients were treated within five days of injury[4]. Patients with head injury or ipsilateral distal radius fracture or any other fracture in the same upper limb were excluded from the study. Patients were assessed at emergency for any vascular or neurological injury of that limb. Patients with the vascular or neurological injury of the fractured limb also excluded from the study. Most of the patients were operated in emergency operation theater.

After anaesthesia, patients were kept in supine position and reduction was done with special emphasis on correcting medial tilt and medial rotation of the fragment. Reduction was checked by C- ARM image intensifier in AP and lateral position. We never rotate the elbow to check the correction after manipulation but always rotate the C-Arm for AP and lateral view.

After correction of displaced fracture fragment, K-wire pinning was done in one of the three configurations randomly. This configuration was two lateral pins, three lateral pins and crossed lateral and medial pin. The arm was immobilized with the posterior POP cast and elbow

fixed at 90°. Posterior cast immobilization of elbow was done for 3-4 weeks. K-wires were removed after 3-4 weeks following radiological evaluation. Elbow movement started just after removal of K-wire. Active elbow movement was encouraged. After 6-8 weeks, patients usually have a full range of movement of the elbow. The patient was then followed up at one monthly interval up to six months clinically, and X-ray was done at three months, four-months and six-months interval.

Fig 1 — Type IV Supracondylar Fracture

Fig 2 — Type III Supracondylar Fracture

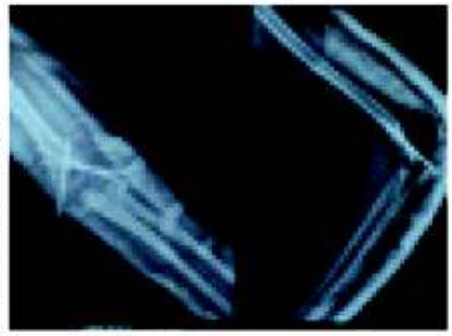

Fig. 3 — Crossed Pin Configuration

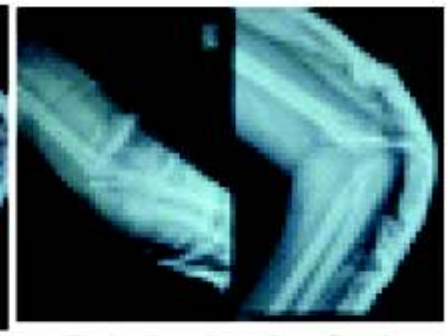

Fig 4 — Lateral two pin configaration

Analysis and Result

Total fifty patients were included, of which 32 were boys and 18 were girls between 4-8 years age group. All patients were treated with K-wire fixation after closed reduction. Forty-six patients were treated at emergency. Patients were treated within five days of the injury. Mean day of interventions from the day of injury was 1.6 days. Twenty-eight patients were treated with two lateral pin configuration, fourteen patients with crossed lateral and medial pin and eight patients with three lateral pins. Thirty-nine patients immobilized for three weeks, nine patients were for four weeks, and two patients were for five weeks. Two patients developed pin tract infection which healed after removal of the pin. One patient was developed median nerve palsy with loss of sensation over the volar aspect of the index finger, and it recovers spontaneously after three months. Elbow stiffness with the range of movement of 10 to 110 degree was seen in three patients and patient did not turn up after six months of follow up (Figs 1-4).

Discussions

Type III and type IV supracondylar fracture should be treated early as our mean day of operative intervention from the day of injury is 1.6 days for a good outcome. The reduction of fracture fragment, especially medial tilt and medial rotation to be corrected accurately to prevent elbow deformity. During reduction, C-arm image intensifier should be rotated, not the limb of the patient. Because, after reduction of fracture fragment if the limb is rotated, at the end of the shoulder rotation fracture fragment will be rotated. This will lead to the displacement of the fragment. To prevent the displacement, C- arm should be rotated to check the reduction. Cubitus varus deformity can be avoided by correcting the medial tilt and medial rotation. Though ideal pin placement is controversial but crossed medial and lateral pin configuration is more stable than the other two configurations.

Conclusion

Supracondylar fracture is more common in boys and is best treated with early reduction and pining in type III and type IV Gratland classification. Most of the fractures had a radiological sign of union within 3-4 weeks of injury. The accurate reduction is the key to prevent the deformity of elbow. Early active movement of the elbow should be encouraged to regain normal elbow movement. So, type III and type IV fractures should be best treated with accurate closed reduction and pinning in paediatric age group patients.

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Original Article

Outcome of Trochanteric femoral nailing in Intertrochanteric Fracture Femur — A Prospective study

Sabyasachi Santra[1], Chaitanya Halder[2], Rwik Ray[3], Krishnendu Roy[3]

Trochanteric femoral nail is recently used as intramedullary device for treatment of intertrochanteric fractures. Trochanteric Femoral Nail (TFN) is very useful in osteoporotic, severely comminuted intertrochanteric fractures. Twenty two patients with intertrochanteric fractures were treated at College of Medicine and Sagore Dutta Hospital, Kamarhati for 2 Years. Patients were operated according to standard protocol. Postoperatively patients were evaluated with Harris Hip Score for functional outcome. Harris Hip Score at the end of 6 months was excellent in 50%, good in 25%., fair in 20% and poor in 5%. Complications are minimal with TFN. Intertrochanteric fractures treated with closed TFN had excellent outcome in most of the patients with early weight bearing and very good healing of fractures.

[*J Indian Med Assoc* 2019; **117(10):** 38-9]

Key words **: Intertrochanteric fractures, Tronchanteric Femoral Nail, Outcome.**

Intertrochanteric fractures of the femur are one of the most common fractures of the hip. There is rising incidence of intertrochanteric fractures because of increasing number of senior citizens with osteoporosis and increasing number of RTA (Road traffic accident). In early days, these trochanteric fractures were treated with sliding hip screw system (DHS or SHS). Intramedullary fixation devices have become increasingly popular now a days because of high rates of failures[1-3] with sliding hip screws in unstable trochanteric fractures. Trochanteric femoral nailing (TFN) was introduced for improvement of the rotational stability of the proximal femoral fracture fragments. TFN is combination of features of intramedullary femoral nail with sliding load bearing bolts for fixation at femoral neck and head. It has got advantages of minimally invasive surgery with early weight bearing[4,5] and less complications[11].

Materials and methods: Study was done at College of Medicine and Sagore Dutta Hospital, Kamarhati, Kolkata from March 2017 to March 2019. Twenty two (22) patients with unstable trochanteric fractures (Fig 1) between the age group 45-75 years were included in the study. They were treated with closed Trochanteric femoral nailing after preanaesthetic fitness. Multiple fractures and pathological fractures were excluded from the study.

Fig 1 — Showing patients with unstable trochanteric fractures

TFN was of 180 mm in length with diameter of 9 mm, 10 mm or 11 mm and was introduced with or without reaming of the medullary cavity by closed method on fracture table. Proximal diameter of the nail is around 15 mm. Nail screw angle used were 130° or 135° with derotation screw of 6 mm and compression screw of 8 mm. Entry point of nail was at the tip or about 2 mm lateral to the tip of the greater trochanter in AP view and at the centre on lateral view of the image intensifier. In severely comminuted fractures insertion was done through fracture site. Post operative x-rays (Fig 2) were taken to see the reduction, alignment and compression at fracture site. Stitches were removed usually on 14th postoperative day. Follow ups were done after 1 month, 3 months and 6 months. Patients were mobilized on 3rd day and partial weight bearing with crutch support

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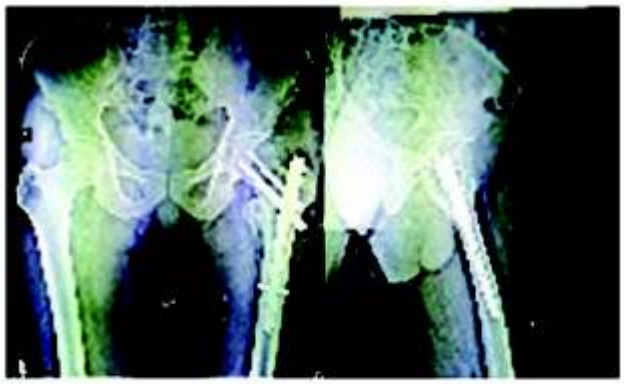

Fig 2 — Showing Postoperative x-rays

was allowed after about 4-6 weeks. All patients were evaluated with Harris Hip Score for outcome.

Results: Male patients were more affected (65%) than females. Average age of the patient was about 67 years. Average time of surgery was about 50 mins. The peroperative blood loss was around 100ml on an average. Postoperative and follow up x-rays were done for evaluation of reduction, alignment and signs of union. One patient had got early complication of superficial wound infection but the wound was healed with dressing and antibiotics. One patient had backout of compression screw on 1 month follow up, most probably due to early weight bearing by the patient. Almost all patients were pain free at 3 months follow up. All patients were evaluate with Harris Hip Score and at the end of 6 months Hip score was excellent in 60%, good in 20%, fair in 15% and poor in 5% cases.

Discussion

Trochanteric femoral nailing is a very safe and effective procedure in unstable trochanteric fractures but is technically demanding and technology dependent. Good quality image intensifier and good quality instruments are must for this operation to be of good quality. But TFN could not be used in trochanteric fractures, where the fracture line extends below the lesser trochanter. Accurate entry point, anatomical reduction and correct proximal reaming path is necessary for the operation to be successful one. Few studies in small patient groups had shown good functional outcome with very few complications with proximal femoral nailing[6-8]. Advantage of TFN is that, it's a closed procedure with minimal blood loss and fewer complications. In our study there is less operative time, less peroperative blood loss. There was no cut out effects of the proximal bolts in our cases. To avoid cut out effects proper positioning of the proximal screws in the femoral neck and head is must[9-10]. Lateral protrusion of the proximal screws are very much relevant due to impaction and collapse at fracture site. In our study one patient had backout or lateral protrusion of compression screw. Impaction of the fracture site is beneficial for better consolidation of the fracture and early rate of union. Mortality rates and general complications did not reveal any surprising results and is consistent with other studies[8,11].

Our study shows that the newly developed Trochanteric Femoral Nailing is a very good procedure with good functional outcome, minimal pitfalls and comparable complications. Optimal reduction of the fracture, proper proximal reaming and proper positioning of the nail and proximal screws are very much crucial for a successful procedure and minimal surgical failures.

So, it is concluded that, unstable intertrochanteric fractures treated with closed TFN had excellent functional outcome in most of the patients with early weight bearing, very good healing of fractures minimal complications.

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Case Report

A rare case of Ocular Dirofilariasis

D N Prakash[1], K Satish[2], Madhumita Gopal[3], Uma Balakrishnan[4], Hemapriya[3]

A middle aged male patient from Mandya presented with pain and a swelling over the nasal aspect of the bulbar conjunctiva lasting for a few days with similar episodes over the past 3 months. On slit lamp examination a mobile thread like worm was observed beneath the conjunctiva. Surgical removal of a live worm was done successfully and sent for histopathological examination, where it was identified to be Dirofilaria repens. Surgical excision of subtenon's dirofilariasis is safe and curative precluding the need for further systemic antihelminthics.

[*J Indian Med Assoc* 2019; **117(10):** 40]

Key words **: Dirofilaria, Ocular.**

A middle aged male patient hailing from Mandya, Karnataka, with no history of travel presented with pain and swelling over the nasal aspect of the bulbar conjunctiva lasting for a few days, with similar episodes over the past 3 months. He had consulted a local doctor where he was suspected to have a foreign body granuloma and was put on topical medication. On slit lamp examination a mobile thread like worm was observed beneath the conjunctiva in the region of the swelling. Rest of the ocular examination was within normal limits and his visual acuity was 6/6 in both eyes. The patient was taken up for surgery. A live worm measuring about 9.5 cm was removed successfully from the subtenon's space and sent for identification. The worm was identified to be Dirofilaria repens on the basis of microscopic examination and histopathology. The patient had no systemic symptoms or signs and the peripheral smear was negative for microfilaria. Following removal the patient had no further complaints (Figs 1-3).

Discussion

Dirofilariasis is a form of zoonotic filariasis caused by the nematode worm, Dilofilaria. It is transmitted to humans by the bite of Aedes, Culex or Anopheles mosquitoes. Dogs, cats, foxes and raccoons are the definitive hosts while humans are accidental hosts. Dirofilariasis is often reported from European countries surrounding the Mediterranean particularly from Italy. The other countries that have reported these infections are France, Greece and Israel. In India, subcutaneous Dirofilariasis is rare and most cases have been reported from Kerala, Karnataka and Tamil Nadu. Ocular Dirofilariasis is a form of subcutaneous Dirofilariasis caused most often by *Dirofilaria repens*. Systemic involvement may be subcutaneous, pulmonary or generalized. Ophthalmic involvement may be periorbital, subconjunctival, subtenon or intraocular. Such lesions are usually associated with moderate to severe inflammation.

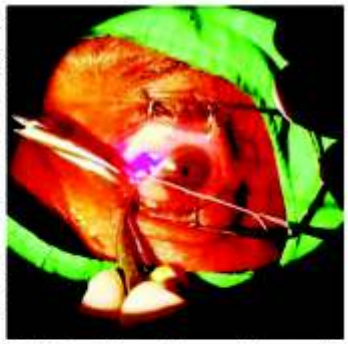

Fig 1 — Worm being pulled out of the Subtenon's space

Fig 2 — Extracted live worm once corneal surface

The symptoms of the disease vary and include local pain, proptosis, diplopia, palpebral and conjunctival edema, redness, foreign body sensation and impaired vision. Surgical removal of the worm is curative and technically a simple procedure.

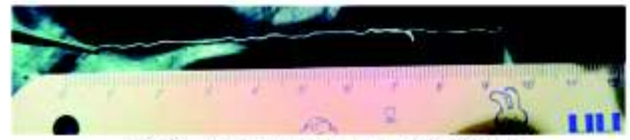

Fig 3 — The worm measured about 9.5 cm

Conclusion

Ocular dirofilariasis is a rare condition. Although the symptoms can be severe, treatment by surgical removal is simple and precludes the need for antihelmenthic treatment.

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National President of Indian Medical Association (IMA) Dr Santanu Sen speaks to a group of journalists at the conference room of East West Media Group Limited (EWMGL) in the capital's Bashundhara Residential Area on Saturday. – SUN PHOTO

Historial Bangladesh Visit of National President

IMA Maharashtra felicitated Kolhapur, Jaysingpur, Kurundwad, Sangli, Miraj, Peth Vadgaon and Karad branches for their exemplary services to the victims of the flood affected areas.

Dharna by KGMOA against attack on Doctors & Medical Institutions

An initiative of IMA Rohini & IAP Delhi

IMA Medicolegal Cell Meeting, HQs

9th week of protest against NMC by AIIMS residents at India Gate !!!

Polythene & Plastic free Bhopal

Petinthalmanna Br.: World Elders Day

An appeal

To
Shri Narendra Modi Ji,
Hon'ble Prime Minister of India,
New Delhi

Respected Prime Minister,

"Kindly provide quality healthcare service to all Indian Citizens by qualified MBBS doctors".

Thanking you,

Place : _____ Signature: _____

(Town) _____ Name: _____

Date : _____ Mobile No.: _____

Get signatures from your patients at least 100-500 numbers collect and post it to P.M. Modiji

Every IMA member to send at least 100 appeals of patients separately and individually by themselves directly to the Hon'ble Prime Minister. NP, HSG & NVP are collecting signatures of their patients. Signature campaign against Myxopathy and creating quacks in rural area by section 32 of NMC

IMA JDN Job World Application

1st Mumbai TB Elimination-TaskForce Meeting at BMC HQs

West Bengal Form No 264

Certificate of Registration of Societies
WEST BENGAL ACT XXVI of 1961
No. S0937997 of 1934-1935

Legacy Registration No. : 08335

I here by certify that THE INDIAN MEDICAL ASSOCIATION has this day been registered under the West Bengal Societies Registration Act, 1961.

Given under my hand at Kolkata this 17th day of May One Thousand Nine Hundred and Thirty Four.

Registrar of Firms,Societies & Non-Trading Corporations
West Bengal

ACJP-A 1076-2003-04-1,10,000

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NATCON 2019

94th NATIONAL CONFERENCE OF INDIAN MEDICAL ASSOCIATION
80th ANNUAL MEETING OF CENTRAL COUNCIL OF IMA
(Organised by Bengal State Branch, IMA)
Friday and Saturday, December 27-28, 2019, Biswa Bangla Convention Centre, New Town, Kolkata
Conference Secretariat: 53, Creek Row, Sir Nil Ratan Sircar Sarani, Kolkata-700014,Bengal, India
Tel.: +91-33-22893728 / 22497086 • **Website:** www.imanatcon2019.com • **Email:** imanatcon2019@gmail.com

Registration Form

Name: Prof/Dr./Mr./Ms._____ _____
Surname Middle Name First Name

Designation _____

Mailing Address_____

City_____State _____Postal/Zip Code_____

Country _____ Phone (Off.) _____(Res.)_____

Fax_____Email Address _____

Accompanying Person(s) Name (1): _____
(2): _____

Amount details: GST details (optional): _____

Registration*: Self: Rs. _____, Accompanying Person(s): Rs. _____

Hotel **: Hotel Name: _____, Dates:Check-in: _____,Check-out: _____

Occupancy type (Pl. tick one): (S)ingle / (D)ouble / (T)win sharing, Accom. Expenses: Rs. _____

Total: Rs. _____Total (in words): Rupees _____

Payment details: NEFT: UTR No. _____, Dt.: _____ / Cheque/D.D. No. _____ dt. _____

* - Delegate Registration Fees (Taxes included): **(Delegate's Signature)**

Category	Till August 31, 2019	Till Sept 30, 2019	Till Nov. 30, 2019	Spot Registration (Cannot beguaranteed)
IMA Members	Rs. 2,360/-	Rs. 3,540/-	Rs. 4,130/-	Rs. 5,900/-
Non-IMA Members	Rs. 3,540/-	Rs. 4,130/-	Rs. 4,720/-	Rs. 5,900/-
Medical Students / P.G. / Junior Residents	Rs. 1,180/-	Rs. 1,770/-	Rs. 2,360/-	Rs. 3,540/-
Accompanying persons (Only participation in sessions and Meals, No delegate kit	Rs. 1,180/-	Rs. 1,770/-	Rs. 2,360/-	Rs. 3,540/-
International Delegates	USD 100	USD 125	USD 150	USD 200
Accompanying Persons (International delegates)	USD 75	USD 100	USD 125	USD 200

** - Hotels and charges (Taxes inclusive):

Hotel Name	Single Occupancy (INR)	Double Occupancy (INR)	Twin Sharing Basis (INR)
Westin, Kolkata	8000	10000	5000
Novotel Hotel and Residences, Kolkata	9000	10000	5000
Pride Plaza Hotel, Kolkata	6000	7000	3500
Holiday Inn, Kolkata	7000	8000	4000

For International delegates only:

Passport details (for Visas purposes): Name (as in passport): _____ No: _____

Issue date___/___/_____ Valid till ___/___/_____ Country of issue: _____

Dietary Requirements

Special dietary requirements for lunch:
I am non-vegetarian/vegetarian/Jain/other (please specify):_____

Special dietary requirements for Dinner:
I am non-vegetarian/vegetarian/Jain/other (please specify):_____

Completed registration form may kindly be sentto the Conference Secretariat as per details on the top of the form

Conference Secretariat:

Contact person in IMA Conference Secretariat:**Mr. Debabrata Chatterjee, Mobile No. +91-9874756756**

All payments to be made in the account of "NATCON 2019" payable by cash/ at par crossed cheque / DD / online transfer through NEFT (A/c Name: NATCON 2019, A/c. No. 3731920708, IFSC Code: CBIN0281041, Type of A/c.: Savings)

Account details for International transactions: - Account Name: Indian Medical Association-FCRA; Beneficiary Bank: Syndicate Bank; Beneficiary Account No: 90672010022569;Bank's Address: CR Building, IP Marg, New Delhi-110002; Beneficiary Bank SWIFT Code: SYNBINBB126; IFSC Code: SYNB0009067;Reference: 'NATCON 2019"

JOURNAL OF THE INDIAN MEDICAL ASSOCIATION:
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Date of Publication : 15th October, 2019

Registration No. KOL RMS / 476 / 2017-19

RNI Regd. No. 2557/1957
VOL. 63, NO. 10, October 2019, Kolkata

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If not delivered please return to Journal of the IMA (JIMA) Sir Nilratan Sircar IMA House, 53 Sir Nilratan Sarkar Sarani (Creek Row), Kolkata - 700 014

Printed and Published by Dr Sanjoy Banerjee on behalf of Indian Medical Association and printed at Prabaha, 45, Raja Rammohan Sarani, Kolkata 700009, and Published from Sir Nilratan Sircar IMA House, 53 Sir Nilratan Sarkar Sarani (Creek Row), Kolkata 700014. Editor : Dr Golokbihari Maji