Tibial nails essay

Business, Management

Tibial NailsThe most common long bone fractures are those of the tibia.

According to National Center for Health Statistics estimates, almost 492, 000 fractures of the tibia and fibula are reported annually in the United States (Cannada, Anglen and Archdeacon 1760). These fractures are most common amongst athletes, especially those involved in activities like running or leaping and thus acquire stress-fractures more commonly, mostly affecting the tibial diaphyses (Guyton 259). Morris and Blickenstaff in their study of 700 military recruits found that 17% of all the stress fractures acquired in the study population occurred in the tibia (Morris and Blickenstaff cited in Guyton 259). Transverse fractures of the tibial shaft are most commonly observed in the middle third; however, fractures of the upper and lower third are also not uncommon (Costigan 180). Studies have shown that fractures of the middle third of the tibia are prone to misalignment and rates as high as 84% have been reported (Cannada, Anglen and Archdeacon 1760). It has also been observed that these fractures account for the second highest number of malpractice claims amounting to around $30 million in compensation (Bhandari, Guyatt and Tornetta 725). Management of Tibial Shaft fractures – The different approaches usedTreatment of tibial shaft fractures is aimed at the achievement of the rapid union of the two ends, which are aligned properly in both the axial and rotational plain while ensuring the maintenance of the initial pre-fracture limb length (Fortis, Dimas and Lamprakis 941). Over the years, several methods have been devised for the management of tibial shaft fractures.

These range from the conservative, strictly non-operative techniques to a multitude of operative techniques (Larsen, Madsen and Høiness 144). Non-

operative techniques were more commonly used in the past and include closed reduction and immobilization (Bone and Johnson 876). The most common operative methods which have been used in the past several years include the use of plates and screws for fixation, external fixation and intramedullary nailing (Fortis, Dimas and Lamprakis 941).

Moreover, the management of open tibial fractures is comprised of not only the stabilization of the tibia using variuos methods, but also includes aggressive management of the injury sustained to the surrounding soft tissues. The steps involved in attaining this purpose include wound exploration, including extensive irrigation and repeated debridement of tissues where required, the use of antibiotics to prevent the occurrence of infection and covering the wound in the early stages (Kakar and Tornetta 153). This initial management can help in the reduction of infection rates by as much as 50% (Edwards, Simmons, Browner et. al. 98). The use of External Fixators and Plate OsteosynthesisFor several decades, orthopedic surgeons have been involved in the quest for an optimal method of skeletal stabilization post-tibial fractures. Initially, external fixators were used for the purpose of stabilization in tibial fractures (Kakar and Tornetta 153).

However, these were found to have several associated problems. These problems include the high rates of pin loosening and dislocation, infections of the pin tracts, poor patient compliance with the treatment method and almost 20% rates of malunion (Kakar and Tornetta 153). All these problems limited the use of external fixators in the management of external fixators. Subsequently, internal fixation involving the use of plates came in to

practice. The use of plates was found to be superior to and more effective than external fixation. However, this method also had certain shortcomings, viz. implant failures and malunion (Kakar and Tornetta 153). Moreover, another potentially hazardous disadvantage of the use of plates was the possibility of deep infections.

Infection rates as high as 35% have been reported with the use of plates for the internal fixation of tibial fractures (Kakar and Tornetta 153). Intramedullary nails and its typesThe use of intramedullary nails was first demonstrated as early as in the post World War I era and over time, these nails by virtue of their advantages over other forms of fixation of the tibia, gained popularity and their use is now widespread. There are several different types of tibial nails available such as rigid, flexible, reamed and unreamed. Moreover, these nails also display geometrical variation. All tibial nails have a proximal bend. However, the curvature of this bend varies and can go up to 14?. There are also differences in the locking mechanisms of different tibial nails and studies have shown that oblique screw locking mechanisms are superior to transverse locking mechanism and provide greater construct stability (Cannada, Anglen and Archdeacon 1761).

Intramedullary nails with distal locking have been shown to provide better axial alignment, and thus lead to reduced rates of malunion. Moreover, they also enable early weight bearing and immediate motion of the knee and ankle (Kakar and Tornetta 153). However, even this method had certain limitations. It was observed that the use of intramedullary nails was

associated with a high incidence of osteonecrosis. This is thought to be brought about by the disruption of endosteal blood supply.

The use of reamed nails damages the nutrient artery of the tibia, thus leading to reduced blood supply and subsequent osteonecrosis. These effects first manifest themselves after a period of two weeks and progressively worsen over time (Brinker, Cook, Dunlap et. al.). Moreover, another serious complication of this method is the possibility of sepsis which is a potentially lethal condition (Kakar and Tornetta 153). Moreover, reamed nails have also been shown to decrease cortical porosity in sheep models (Schemitsch et al 373). Unreamed tibial nails were thus designed to overcome the limitations associated with the use of reamed nails. These nails were designed so as to cause lesser disruption of the endosteal blood supply and thus are associated with a reduced incidence of osteonecrosis (Kakar and Tornetta 154).

Several studies have supported the use of tibial nails without reaming and have shown them to be more beneficial and associated with lesser complications as compared to reamed nails. Sanders et al in their observation of 43 patients undergoing tibial intramedullary nail implantation without reaming elucidated that these nails were highly efficacious in bringing about proper alignment of the tibia and had lower rates of infection. Moreover, unreamed nails have also been shown to be better than other forms of fixation including external fixation in that they provide better range of motion, require lesser angulation at the fracture site and can be easily managed while performing debridement of surrounding soft tissues and

performing bone grafting (Whittle et. al. cited in Kakar and Tornetta 156). Reamed versus Unreamed Tibial Nails – A comparisonThere has been ongoing controversy regarding the use of reamed vs. unreamed nails and the use of both these types of nails have been shown to have their own merits and demerits. A major concern with the use of reamed tibial nails is their potential to cause damage to the intramedullary blood supply as proven by several studies.

It has been elucidated that reaming causes a disruption in the endosteal blood supply and induces a significant periosteal reaction. Comparative studies have demonstrated that the use of reamed nails leads to a 70% reduction in blood flow as opposed to a 30% reduction with the use of unreamed nails (Larsen, Madsen and Høiness 144). Moreover, almost two weeks after the use of reamed nails, the process of revascularization starts and reaches a maximum by eight weeks (Danckwardt-Lillestrom cited in Court-Brown 96). It has also been shown that the use of reamed nails affects twice the depth of the bone cortex as compared to the use unreamed nails (Kakar and Tornetta 156). These findings support the use of unreamed nails and suggest that in the initial period after the use of the nail, the use to unremaed nails is better than that of reamed nails because of its lesser disruption of endosteal blood supply and lesser cortical damage (Kakar and Tornetta 156). Moreover, reaming has also been shown to be associated with the causation of thermal necrosis which has several subsequent complications including the death of osteocytes and resulting osteomyelitis (Kakar and Tornetta 156). Other complications of the use of reamed nails include increased rate of infections.

In addition, the operative time required with the use of unreamed naills is shorter as compared to that required with reamed nails. This also adds to the benefits of using the unreamed nails (Larsen, Madsen and Høiness 145). On the other hand, an advantage of the use of reamed nails is their ability to increase periosteal circulation. This has several benefits as it promotes callus formation and subsequent bone union (Larsen, Madsen and Høiness 144).

Thus, where on one hand reamed nails cause a reduction in the endosteal blood supply, on the other hand, they result in an increase in the periosteal blood supply, thus aiding callus formation and bone reunion. Reaming also leads to shorter healing times required as compared to the use of unreamed nails as elucidated by Blachut et. al.

(Larsen, Madsen and Høiness 145). The use of unreamed nails has also been shown to have some limitations. Studies show that there is a high risk of screw failure, ranging from 29-40%, with the use of unreamed nails (Kakar and Tornetta 156). Moreover, there is also a greater chance of malunion and nonunion with the use of unreamed nails (Larsen, Madsen and Høiness 144). Complications associated with Intramedullary NailsThe use of intramedullary nails has been shown to be superior to all other forms of fixation used for the management of tibial fractures both in terms of treatment efficacy and the occurrence of complications. However, there are certain complications which are associated with the use of tibial nails. Amongst these, the most pertinent ones are infections, the possibility of malunion and nonunion and anterior knee pain. Thus, in conclusion, obtaining the optimum results with tibial

shaft fractures has posed a challenge for the orthopedic surgeons for a long time now.

The management of tibial fractures has evolved over the period of time and the use of intramedullary nails has been shown to be the most effective technique in the management of tibial shaft fractures. Two main varieties of tibial nails are available viz. reamed and unreamed tibial nails, and both have their associated benefits and risks. However, studies have proven the use of unreamed nails to be more beneficial and thus they are considered to be the most effective device use in the management of tibial shaft fractures. ReferencesMorris JM, Blickenstaff LD: Fatigue Fractures—A Clinical Study. Springfield, IL, Charles C Thomas, 1967.

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