

Management Approaches of Floating Knee Injuries: Review

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Abstract: Floating knee injuries mostly comes together with other severe injuries. Our study aims to assess the management and treatment of this injury, associated injuries, method and results of treatment, and complications of floating knee are discussed. We conducted computerized search among electronic databases; EMBASE, COCHRANE and MEDLINE for literature available in the databases to September,2017 using the following search term including variants: “floating knee”, “surgery”, “Management”, “treatment”. Floating knee, with ipsilateral femoral and also tibial fracture, is a severe injury, mostly related to high-energy injury and also to numerous linked injuries, which are commonly very serious, as well as both systemic and local. In planning therapy, it is important to think about the patient's general problem as well as the situation of the limbs. Sometimes, amputation good alternative option. It's very important to consider injuries and complications before deciding the plan for surgery. That's, these injuries require management by an experienced multidisciplinary team.

Keywords: Floating knee injuries, tibial fracture.

1. INTRODUCTION

Floating knee (FK) is a term applied to describe fractures impacting the ipsilateral tibia and also femur. These fractures could impact the diaphysis, the metaphysis as well as the articular complicated, such that the knee ends up being "separated" from the remainder of the arm or leg. Its specific occurrence is unidentified, this problem is normally unusual, although it is been boosting in current years in the exact same percentage as the number of polytrauma patients influenced by high-energy injury. Being usually triggered by such injury, floating knee is typically experienced by patients that likewise provide with serious injuries to the upper body, head, abdominal area and/or arm or legs [1]. A few other difficulties derivable to floating knee injuries consist of infection, extreme blood loss, fat embolism, malunion, postponed or nonunion, knee tightness, long term a hospital stay, and also incapacity to carry weight [2]. Vascular injuries are much more generally related to this kind of injury when the breaks existing alone, which in some noted research studies takes place in approximately 29% of situations [3]. Various other writers think these issues are much less regular [4]. Some records have actually explained the visibility of open floating knee in 60-80% of situations [5]. It is additionally connected with neurological injuries and also fat embolism.

In 1975, Blake and also McBryde developed the principle of 'floating knee' to explain ipsilateral cracks of the femur and also tibia [6]. Roadway traffic crash (RTA) cause most of the situations, as well as is complied with by falling from the height (FFH). Inning accordance with Fraser [7] the FK consists of numerous patterns: bi-diaphysis cracks (kind I), combined diaphysis fracture on a bone as well as epiphyseal fracture on the various other (kind II A, B) as well as reciprocal epiphyseal (IIC).

Complications, such as compartment syndrome, losing of knee movement, failing to identify knee ligament injury, and also the requirement for amputation, are not unusual. When both cracks are diaphyseal compared to when one or both are intra-articular [much better outcomes as well as less issues are observed [8].

Floating knee injuries are typically related to various other substantial injuries. Do these injuries have effects on the management of the floating knee and also the last end result of patients? Our research study intends to analyze the effects

of linked injuries in the management and also last result of floating knee. This research was created to provide our experience with therapy of this injury throughout; age, sex, device of injury, connected injuries, technique as well as outcomes of therapy, and also problems of floating knee are reviewed.

Floating knee injuries mostly comes together with other severe injuries. Our study aims to assess the management and treatment of this injury, associated injuries, method and results of treatment, and complications of floating knee are discussed.

2. METHODOLOGY

We conducted computerized search among electronic databases; EMBASE, COCHRANE and MEDLINE for literature available in the databases to September,2017 using the following search term including variants: “floating knee”, “surgery”, “Management”, “treatment”. Restriction to only English language with human subjects were applied. Reference lists from all articles were scrutinized to identify any additional studies of interest.

3. DISCUSSION

- **Classification:**

In 1978, Fraser [7] categorized kind II innings accordance with knee injury kind (**Fig 1,2**). Kind II a) (8%) is a tibia plateau fracture connected with a femoral shaft fracture, kind II b) (12%) is an articular fracture of distal femur connected with a tibial shaft fracture as well as kind II c) (9%) is a fracture of the tibia plateau and also articular fracture of the distal femur [9].

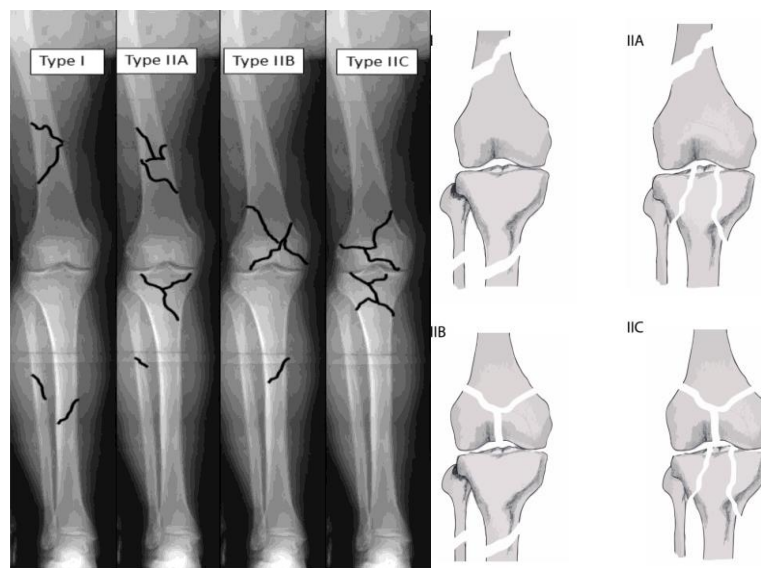


Figure 1&2: Fraser's classification of floating knee.

- **Preoperative Evaluation and Initial Management:**

Patients with floating knee are normally sufferers of polytrauma and also the involvement of various other body organs is highly assumed. Orthopedic surgeons usually advise numerous therapy routines for floating knee injuries, very early and also specifically hostile stabilizing of both femoral and also tibial fractures no matter the therapy approach [10]. Some authors have actually reported that the difficulty rate, as well as death, continue to be high no matter the therapy program used [11].

The system is generally a high-energy injury in bikers, bumps in between autos as well as 'tore down' pedestrians, frequently observed in young men [10]. Extreme linked injuries have a mean Injury Severity Score (ISS) of over 16 [9] with the serious head injury in 14% [13] as well as breast as well as stomach sores along with those of the influenced arm or leg, such as extreme affiliated soft-tissues [14]. Popliteal artery lesions influence 7% and also a minimum of the tibia or the femur fracture is open in 69% of the situations [9]. Involved fractures may be found in 44% of patients. The fatality rate on admission may be until 10% [15]. Popliteal artery lesions and/or serious mangled arm or legs as well as open fractures could cause amputation in 9% of the patients throughout the very first 24 hrs of admission. Joint as well as knee

ligament injuries prevail, with a laxity until 19% [16]. Fat embolism and also compartment syndromes are additionally typical [9], [17].

In the very early stage of maintenance for polytrauma patients with fractures of the hips and/or long bones, it is especially essential to identify the level of the injury related to the soft tissues and also the existence of vascular injury and also compartment syndrome, as these sores call for instant, immediate therapy as well as their end result will straight depend upon the hold-up or otherwise in this regard [18]. The standard method in examining polytrauma patients is to think about their haemodynamic security. The "triad of fatality" is a term created to define the decompensation triggered by acute blood loss, leading to coagulopathy, hypothermia as well as acidosis. The avoidance or reversal of these elements might stop fatality from exsanguination. Extra current researches have actually highlighted the impact of orthopaedic injuries on this set of three [19].

The right time to cure a fracture relies on proper resuscitation having actually been carried out. Pens that are regularly utilized consist of diuresis, pulse rate and also high blood pressure. Preferably, all these criteria ought to be normalised before taking on the addiction of fractures. It is of certain significance to turn around any type of coagulopathy and also to fix the core body temperature level. If the core body temperature level is not recovered throughout the very first stage of care [18,19]. According to the capability to recover these criteria, patients are separated right into 4 groups throughout the resuscitation stage: steady, borderline, unpredictable, as well as in extremis.

When taking into consideration the medical therapy to be put on orthopaedic injuries, a variety of top priorities need to be taken into consideration. The initial of these is to conserve the patient's life and also, where viable, the extremity, as well as to restrict the moment invested in the operating room to less than 2 hrs [19] Within this medical home window, open fractures must be debrided as well as secured with an outside fixator. A splint could suffice for upper extremity sores. Negative pressure treatment plays an important function in the therapy of orthopaedic injuries. A preliminary amputation could rescue the life of a patient in extremis because of the fracture of an extremity or an open fracture with vascular injury. Certain standards could not be suggested for every single circumstance, as varied variables need to be thought about in every situation.

Using exterior fixation as a first method prevents the requirement for even more lengthy treatments that could get worse the "triad of fatality". In this regard, treatments lasting greater than 6 hrs are especially harmful, as they are related to greater prices of acute breathing distress syndrome as well as several body organ fail. Some elements, straight appropriate to the job of orthopaedic surgeons, are related to negative end results; these consist of several long bone fractures, pelvic injury in the existence of haemorrhagic shock, medical time surpassing 6 hrs, and also lung artery pressures over 6 mm/Hg throughout intramedullary nailing, which is a measure of substantial lung damages [21].

Injuries (head, upper body or various other fractures as well as vascular injuries) play a considerable function in medical decision-making pertaining to the timing as well as series of surgical treatment.

Due to the fact that they could be life harmful, it is crucial to detect the lesion connected with floating knee. The influence on the extremity systems (soft tissue, nerves, vasculature as well as bone) need to be identified. The surgeon needs to make a decision in between preliminary amputation or salvage when they are seriously influenced. The MESS (Mangled Extremity Severity Score) scale takes into account: (1) skeletal and soft-tissue injury; (2) limb ischemia; (3) shock; (4) the patient's age [22]. This method has proof to help in the clinical management of such lesions (**Table1**).

Table 1. Mangled extremity severity score (MESS) [22].

Mangled Extremity Severity Score (MESS)			
Type	Characteristics	Injury	Points
1	Low Energy	Stab wound, simple closed fracture, small-calibre GSW	1
2	Medium Energy	Open/multilevel fracture, dislocation, moderate crush	2
3	High Energy	Shotgun, high-velocity GSW	3
4	Massive Crush	Logging, railroad, oil-rig accidents.	4
Shock Group			
1	Normotensive transiently	BP stable	0
2	Hypotensive prolonged	BP unstable in field but responsive to fluid	1

Mangled Extremity Severity Score (MESS)			
Type	Characteristics	Injury	Points
3	Hypotension	SBP <90mm Hg in field and responsive to IV fluids in OR	2
Ischemia Group			
1	None	Pulsatile, no signs of ischaemia	1
2	Mild	Disminished pulse without signs of ischaemia	2
3	Moderate	No dopplerable pulse, sluggish cap refill, paresthaesia, diminished motor activity.	3
4	Advanced	Pulseless, cool, paralysed, numb, without cap refill	4
Age Group			
1	< 30 years		0
2	30-50 years		1
Six or fewer points: consistent with a salvageable limb			
Seven or greater: amputation generally the eventual result			

GSW: gunshot wound, BP: blood pressure. SBP: Systolic blood pressure. IV: intravenous. OR: Operation room.

Lots of various other evaluation procedures have actually been recommended, yet none has actually been definitively approved in choice making concerning arm or leg salvage versus amputation in the management of patients with extreme arm or leg injury. For that reason, more study is should figure out much more specifically the elements that could aid decision making, and also to decrease the regularity of unsuccessful salvage efforts. Medical and also medical developments in recent times have actually improved the capacity to rebuild seriously harmed arm or legs, such that arm or legs which years earlier would certainly have been cut off are currently consistently handled and also recovered.

Damage control therapy for floating knee entails not just bone stabilisation using an outside fixator and also the therapy of open fractures by injury cleaning and also debridement (on top of that, sometimes, adverse stress treatment [23] or antibiotic beads could be helpful) [24] yet likewise, and also essentially, the therapy of connected lesions such as vascular injury or compartment syndrome, where the equivalent fasciotomy should be done.

• **Treatment:**

Typically, ipsilateral femoral and also tibial fractures were dealt with by nailing just the femur and also safeguarding the orthopaedic immobilisation of the tibia. Nonetheless, this technique prompted several problems, consisting of fat embolism [25]. Akinyoola et al. reported the existence of considerably even more difficulties in patients whose therapy was postponed as well as in those that were not dealt with operatively [26].

The conclusive therapy that is most extensively approved today is that of medical stabilisation of both bones, individualised for each and every patient and also fracture [27] The instructions and also place of each fracture, the soft tissue standing, the sources offered and also the medical ability used all play a vital function in identifying one of the most proper therapy.

Requirement technique is for anterograde femoral nailing to be done initially, complied with by anterograde tibial nailing. An option technique has actually been taken into consideration, where both bones are interlaced using a solitary median parapatellar strategy, whereby a backward femoral nail as well as a tibial anterograde nail are put [28] Rios et al. researched 43 patients with floating knee injuries, a therapy team of 25 patients, treated with backward femoral nailing as well as anterograde nailing of the tibia via a solitary laceration, and also a control team of 18 patients treated with typical intramedullary anterograde femoral and also tibial nailing. Inning accordance with the outcomes reported, the femoral backward technique calls for much less prep work, anaesthesia and also surgical procedure time compared to the standard anterograde femoral technique; in addition, it creates much less blood loss. These authors wrap up that the solitary laceration method is a secure and also fast treatment that makes up a legitimate option therapy for kind I floating knee [29].

Femoral nailing is done initially, while the tibia is impermanently secured with a splint or, in cases of serious comminution, with an exterior fixator. If the tibia were secured initially, the activity and also contortion of the femur

throughout surgical procedure would certainly trigger higher damages to the soft tissues as well as position a raised danger to the patient's basic problem, consisting of the raised occurrence of fat embolism [27], [30].

If short-term addiction is required, it is advised to make use of fixators that work with MRI scanning, due to the fact that after momentary stabilisation, MRI of the knee is suggested, preferably, if a tendon injury is thought [31]. When the last fixation is done, either by ETC or after consecutive therapy, a medical assessment must be performed of the ligamentous standing of the knee, under anaesthesia.

The vascular lesion of fractures around the knee, mainly of the popliteal artery, is an injury that happens in approximately 29% of fractures, and also the occurrence of amputation may be as high as 21% [32]. In conducting a neurovascular evaluation of polytrauma patients, this ought to consist of an evaluation of the peripheral pulses, from the ankle joint brachial pressure index, sustained by Doppler ultrasound exam as well as the careful use angiography. Although the preliminary physical exam might ignore vascular injury, it might happen throughout the very first 24 hrs because of the advancement of arterial thrombosis or the development of insufficient injuries. Appropriately, vascular fixing surgical procedure need to be quickly embarked on after the short-term addiction of unpredictable fractures [33].

- **Complications:**

As a whole, the therapy of floating knees generates mixed outcomes, and also rates of problem are high. One of the most typical are systemic, like fat embolism, kidney failing, or head, chest or stomach lesions, and also the sequelae of various other injury. Impacts might additionally be regional, straight pertaining to the injury of the extremity, consisting of discomfort, ligamentous laxity, lowered articular flexibility, hopping, postponed union or nonunion, osteomyelitis or even the have to cut off the arm or leg [34]. Kind II floating knee appears to be related to a higher level of systemic injury, a greater portion of open lesions as well as a lot more severe diagnosis [35].

Kao et al. discovered that floating knee injuries are generally related to high rates of difficulties and also death, no matter the therapy routine applied. These difficulties are related to age (even more typical in patients aged 60-89 years), the sort of injury (higher in kind II floating knee, inning accordance with the Fraser category) as well as location (better in tibial plateau, distal tibia and also open fractures) [36].

4. CONCLUSION

Floating knee, with ipsilateral femoral and also tibial fracture, is a severe injury, mostly related to high-energy injury and also to numerous linked injuries, which are commonly very serious, as well as both systemic and local. In planning therapy, it is important to think about the patient's general problem as well as the situation of the limbs. Sometimes, amputation good alternative option. It's very important to consider injuries and complications before deciding the plan for surgery. That's, these injuries require management by an experienced multidisciplinary team.

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