



Full length article

Complex knee injury scenario in tertiary level care in North India: An epidemiological study



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ABSTRACT

Floating knee injury has been considered as one of the severe orthopedic injury, and is often associated with major systemic trauma involving other organs.

Objective: To identify the incidence of floating knee injury, severity of injury and associated orthopaedic and non-orthopaedic injury.

Methods: Epidemiologic study conducted from 1 Jan 2014 to 31 Dec 2014.

Results: A total of 136 cases with floating knee injury were registered. Modified Fraser classification showed 58 patients had type 1, 74 had type 2 and 4 had type 3 floating knees. 119(87.5%) patients had open fractures and Gustilo-Anderson type IIIA(29.4%) being the commonest. No Mortality was found. 16 (11.76%) of floating knees had to undergo amputation of afflicted limb.

Conclusion: Statics of such data would be helpful in planning and preparing ourselves as healthcare professionals to prevent high mortality and morbidity/disability in floating knee injury.

Study design: Retrospective Epidemiological.

Level of Evidence: Level 4 (Case Study).

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1. Introduction

Developing countries like India are facing a myriad of problems that impede development of the country e.g. increasing population, illiteracy, lack of infrastructure etc. The health-related problems make majority of burden to the financial system. Chokotho et al. concluded that the current capacity of hospitals in sub-Saharan Africa to manage traumatic injuries and orthopaedic conditions is significantly limited.¹ Injury is responsible for more years of lost productive life than cancer and cardiovascular disease combined.² Injuries make up a significant component of trauma and musculoskeletal impairment globally, accounting for roughly the same number of deaths each year as HIV, TB, and malaria combined.³ Injury could happen consequent to the various cause among them road traffic accidents are commonest. Nearly 90% of the world's road traffic fatalities occur in low-income and middle-income countries (LMICs), even though these countries have only approximately half of the world's vehicles. Half of those dying from road traffic accidents are "vulnerable road users" such as pedestrians, cyclists, and motorcyclists.⁴ This could have very high impact on economy of any growing nation, because the

population involved in RTA is actually most contributing for the economic growth of family, society and country.⁵ Orthopedic injuries such as fracture neck of femur in geriatric population have been studied more frequently because of significant associated morbidity, mortality and financial burden. But not much data is available about the younger population sustaining severe lower extremity trauma. One of such identified injuries is floating knee injury. However this injury has been considered as one of the severe orthopedic injury, and is often associated with major systemic trauma involving other organ. Poor outcome and high disability consequent to these injuries and its impact on the day-to-day activity and productivity of an individual have been shown.^{6–8} Being a highly specialized structure in human weight bearing, it bears considerable amount of stresses and demands more attention and specialized care for satisfactory locomotion. But comprehensive data still lacks about the incidence of such injuries to gauge the burden of problem, severity of orthopedic injury to predict evidence based effect on locomotion/knee function and associated systemic injury incidence that add to the mortality risk and need for the specialized care. Such study has more relevance for the country in which most of the population comprises of younger age group. Hence we did an epidemiological study of patients reporting to tertiary level consequent to RTA with

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an aim to identify the incidence of floating knee injury, severity of injury and associated orthopedic and non-orthopedic injury.

2. Material and methods

We have collected data, from 1st Jan 2014 to 31st Dec 2014, of all the patients registered in ATC OPD of PGIMER, Chandigarh, India (a tertiary care center) with injury around the knee joint. Routine demographical details were collected. All the injuries were assessed for severity using various classification systems as in Table 1

Local orthopedics severity were assessed using-

1. Gustilo-Anderson's classification
2. Modified Fraser's classification

Injury severity scores, Mortality, Amputations, Associated bony and non-orthopedics injury were also recorded.

3. Results

During the defined period a total of 3095 cases were registered in ATC OPD of PGIMER, Chandigarh, 136 cases with floating knee injury were registered thus incidence being 4.3% of all registered cases presenting after trauma. 99.26% of the all "floating knees" were due to RTA. Most of the cases (54.41%) were under age of 30 years (n=74) followed by age bracket of 30–50 years (n=51). Majority of the floating knee injuries were sustained with 4-wheeler (n=110), 2-wheeler (n=20) and pedestrian (n=6). Floating knee classified under Modified Fraser classification showed 58 patients had type 1, 74 had type 2 and 4 had type 3 floating knees. Three cases constituted a fatal triad injury⁹ and 28 cases qualified as ipsilateral dyad¹⁰ injury.

119 (87.5%) patients had open fractures and Gustilo-Anderson type IIIA (29.4%) being the commonest. All the patients except 5 had ISS more than 17 and were classified as polytrauma and the leading cause for the higher ISS was external injury in combination with bony injury (Table 1).

In the entire series of 136 patients with floating knee injury, 72 (52.94%) patients sustained orthopedics injury involving opposite lower extremity, upper extremity or pelvis or in combination. Involvement of other organ system injury was encountered in 49

(36.02%) patients most common being head injuries followed by vascular injury and blunt trauma abdomen.

No Mortality was found. 16 (11.76%) of floating knees had to undergo amputation of affected limb. Out of those 16 patients 11 had primary amputation of affected limb.

4. Discussion

Floating knee injury is often consequent to very high velocity trauma, which involves fracture of femur and tibia. Fracture of two very strong bone of human body required immense force. Our data here highlight the burden of such severe orthopedics injury, which could add to morbid period for a healthy active economically, physically and socially young population of a growing nation and that could possibly hinder the expected growth. During the study period we have received 136 (4.4%) cases with floating knee injury out of total of about 3095 patients.

4.1. Effect of local severity of injury on outcome

Blake and McBride¹¹ defined the floating knee injury as the ipsilateral fractures of the femur and the tibia. Fraser et al. in year 1978 classified floating knee in more detail.¹² This classification was again modified by Letts and Vincent¹³ in 1986 which included soft tissue injury associated with these injuries.

Injury pattern is considered as one of the important predictor affecting the outcome, some of the identified pattern in periarticular fractures are articular involvement and severity of soft tissue damage.¹⁴ In our series it was found to be 57.34% as per modified Fraser's classification. It is considered to be the one of the independent risk factor to cause dissatisfaction among 75% of the patients because of posttraumatic arthritis and to the surgeon because fate is more or less remain unchanged even after improved surgical methods.¹⁵ In a small series of 21 by Paul et al. only 33% of the patient had intra-articular fracture, at the final follow-up only 11 patient's results were reported with average loss of 45° of flexion and 24% amputation rate. Even after all endeavor of performing 70 secondary surgical procedures results shows very high complication rates.¹⁶ Not much supporting literature is available on the functional recovery focused on floating knee injury with associated severe systemic injury. Thomson AB et.al⁶ evaluated long-term functional outcomes of intra-articular distal

Table 1

Division of Floating knee cases (Modified Fraser Classification).

Type I	Type IIA	Type IIB	Type IIC	Type III		
58 (42.64%)	13 (8.08%)	23 (16.91%)	38 (27.94%)	4 (2.94%)		
Gustilo Grade I	Gustilo Grade II	Gustilo Grade IIIA	Gustilo Grade IIIB	Gustilo Grade IIIC		
3 (2.20%)	24 (17.64%)	40 (29.41%)	35 (25.73%)	17 (12.5%)		
NISS <17			NISS>17			
5 (3.86%)			131 (96.32%)			
Age Distribution of Cases						
Age				Number of Floating Knee Cases		
<30 Yrs				74		
31–50 Yrs				51		
>50 Yrs				11		
Associated orthopaedics injury						
	Upper Limb	Lower Limb	Upper and Lower Limb	Upper, Lower Limb and Pelvis	Lower Limb and Pelvis	
No of cases (n-72)	9	40	13	5	5	
Associated non orthopaedics injury						
	Head Injury	Blunt Trauma Chest	Blunt Trauma Abdomen	Genito Urinary Injury	Vascular injury	Facio Maxillary Injury
No of Cases (n-49)	16	5	12	1	12	3

femur fractures after ORIF and retrograde intramedullary nailing and reported complications like subsequent bone-grafting procedures (67% vs 9%), infection (25% vs 0%), malunion (42% vs 0%) and nonunion (33% vs 9%) were higher in ORIF compared to the less invasive retrograde intramedullary nailing treatment. The physical function component of the SF-36 was reported to be two standard deviations below mean, and 50% of patients had radiographic changes of posttraumatic arthritis. Canadian Orthopaedic Trauma Society performed a multicenter, prospective, randomized clinical trial for bicondylar tibial plateau fractures and concluded that regardless of treatment method, patients with this injury have substantial residual limb-specific and general health deficits at two years of follow-up.¹⁷ Moore TM et al. in their retrospective study included 309 patients with 320 diaphyseal femur fractures with ligament injuries in knee and suggested that, better range of knee motion was obtained when both the femur and ligament injuries are surgically managed, but most patients are disabled.¹⁸

Associated higher severity of the soft tissue injury complicates the outcome. In a small series of Hegazy et al., 3 poor results out of 15 cases were encountered in patients with the intraarticular fracture and open 3b fracture. Open injuries were encountered in 86.14% of the cases, out of that 38% were grade 3b and c open fracture.¹⁴ One of the largest series of open fractures from Gopal et al. reported best outcome with early stage fix of fracture and coverage of open injury with flap. The endeavor includes 84 flaps 9 local and 75 free flaps most within 72 h. Even the best of the effort also led to 37% of complication, which required intervention related to nonunion, and malunion. The complications were found even higher in case of delayed intervention because of the associated other injury.¹⁹ In our series only 27% of the injuries are with mild to moderate severity of open injury, 63% are grade 3 open injuries. Multiple anticipated intervention to deal with the injury and associated multiple trauma, polytrauma nature injury make it even more complex in view of hospital stay, duration/timing of surgery. Due to severity of soft tissue injury and vascular injury 12.5% required amputation as index or secondary procedure.

4.2. Effect of Systemic injury

In our series as per ISS, 96.32% of the cases can be considered as polytrauma although such statics cannot be generalized to all the hospital. As our institute is only trauma center and tertiary level referral center covering large population and area. Whatever be the reason, but in reality, such severity of injury explains the very high expected mortality of about 40%.²⁰ Exaggerated SIRS in this particular group of the patient could heighten the adverse consequences, if unplanned orthopedics intervention focus to provide fracture care, which adds to secondary insult.^{21,22} So often such systemic condition dictate modifications in treatment plan, for example delay of definitive care (Damage Control Orthopedics), intervention of the major life threatening injuries only and deferring management of other injuries at second stage.²³ This is followed by staged, definitive fracture fixation following dissipation of the inflammatory response, which means patient has to undergo multiple surgeries till he get definitive care.

5. Conclusion

We have tried to compile the data to increase awareness about association of the high incidence severe systemic injury and poor

functional recovery in floating knee injury. The victims to such devastating injuries are young patients consequent to the road traffic injury. Statics of such data would be helpful in planning and preparing ourselves as healthcare professionals. Increased road traffic accidents in our country demands a generation of lots of awareness to prevent such incidents but simultaneously more guidelines need to be formulated to prevent high mortality and morbidity/disability in youth of our nation. More specialized care to such cases should be considered to reduce the ill effect of these injuries on the productive population of any developing country.

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