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Original Research Article

Observational Study of Clinical Profile of Fracture Patella

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Abstract

Background: Patellar fractures are a common yet significant injury affecting the knee joint's extensor mechanism, with varying etiologies and treatment modalities.

Methods: A retrospective study was conducted on 63 patients with patellar fractures at a tertiary care hospital in Southern India. The study assessed the demographic and clinical profiles, including the mode of injury, fracture type, and treatment procedures.

Results: The cohort consisted predominantly of males (61.9%), with a mean age of 49.9 years. The majority of injuries were due to RTAs (55.6%). Transverse fractures were the most common type (55.6%), followed by comminuted (stellate) fractures (31.8%). Tension band wiring (TBW) was the primary surgical procedure performed (66.7%). No significant associations were found between fracture characteristics and sex, age, or occupation.

Conclusion: Patellar fractures commonly affect males in their middle ages and are often the result of high-velocity impacts such as RTAs. Transverse fractures are the most frequently encountered, with TBW being the preferred treatment. The lack of association with sex, age, or occupation suggests that patellar fractures may be more influenced by extrinsic factors.

Keywords: Patellar fractures, Tension band wiring, Road traffic accidents, Transverse fractures, Orthopedic injuries.

Introduction

The patella, commonly referred to as the kneecap, is a small bone located within the quadriceps tendon that articulates with the femur and plays a crucial role in knee joint mechanics. Patellar fractures constitute approximately 1% of all skeletal injuries and can significantly impact the extensor mechanism of the knee [1]. These fractures are generally the result of either direct trauma to the knee, typically from falls or blunt force, or indirect trauma through sudden contraction of the quadriceps muscle [2]. Given the essential function of the patella in the kinematics of the knee joint, fractures often lead to considerable morbidity, prolonged rehabilitation, and a substantial economic burden on healthcare systems [3].

The demographic profile of patients with patellar fractures varies widely across different geographical regions and is influenced by factors such as age, sex, occupational hazards, and physical activities [4]. A comprehensive understanding of the epidemiology and clinical profile of patellar fractures can guide healthcare providers in improving diagnostic strategies, treatment modalities, and preventive measures. This study aims to elucidate the clinical and demographic profile of patellar fractures in a tertiary care setting in South India, reflecting on how these parameters may differ from or align with global data.

Epidemiologically, patellar fractures are more commonly observed in men than in women, with the peak incidence in men occurring between the ages of 20-50 years [5]. The increased incidence in this demographic is often attributed to higher engagement in physical and high-risk activities.

However, with changes in lifestyle and increasing urbanization, the age distribution and risk factors are evolving, necessitating regular updates to the clinical profile [6].

Clinical presentation of patellar fractures typically includes pain, swelling, and an inability to straighten the knee or perform a straight leg raise. The presence of a palpable gap in the tendon, abnormal patellar mobility, or the 'patellar ballottement' sign can indicate a displaced fracture or complete disruption of the extensor mechanism [7]. Radiographic examination, usually with anteroposterior and lateral views, is the primary method for diagnosing patellar fractures. Advanced imaging techniques such as computed tomography (CT) or magnetic resonance imaging (MRI) may be required in complex cases to assess the extent of the fracture and associated soft tissue injuries [8].

The management of patellar fractures depends on the type of fracture, degree of displacement, stability of the extensor mechanism, and the presence of comorbid conditions. Non-displaced or minimally displaced fractures may be treated conservatively with immobilization and physical therapy. In contrast, displaced fractures often require surgical intervention to restore the extensor mechanism and allow early mobilization [9]. Various surgical techniques, including tension band wiring, screw fixation, and partial or total patellectomy, have been described in the literature, each with its indications and associated complications [10].

In the South Indian context, where the study is focused, understanding the nuances of patellar fracture profiles is crucial due to the diverse population and unique occupational and environmental factors that may influence injury patterns. The agrarian economy, increasing urbanization, traffic accidents, and sports-related injuries contribute to the regional profile of patellar fractures [11]. Moreover, considering the variations in healthcare facilities, surgical expertise, and rehabilitation services across different regions in India, outcomes of patellar fractures may also vary significantly [12].

The tertiary care hospital in South India where this observational study is conducted serves as a referral center for a vast population, providing a substantial database of patients with patellar fractures. The findings from this study are expected to contribute valuable data to the existing literature on the epidemiology and management of patellar fractures in the Indian subcontinent and aid in comparison with global standards.

Conclusively, this observational study is poised to fill the gap in the literature regarding the clinical profile of patellar fractures in South India, offering insights into patient demographics, fracture patterns, treatment outcomes, and rehabilitation challenges. Such data are imperative for healthcare providers to develop targeted strategies for prevention, efficient management, and allocation of resources to improve patient outcomes.

Aims and Objectives: To assess demographic profile and clinical profile of patella fractures among patients attending tertiary care hospital of South India

Materials and Methods

Study Design and Setting

A cross-sectional study was conducted over the course of one year, from January to December 2019. The setting was the orthopaedic outpatient department (OPD) of a tertiary care hospital, which serves as a referral center in the Shivamogga district of Southern India. This hospital is equipped with the necessary infrastructure and staff to manage a variety of orthopaedic conditions, including fractures.

Participants: The study population included patients of all ages and sexes who were diagnosed with patellar fractures. Inclusion criteria were strictly patients who attended the orthopaedic OPD from within Shivamogga district and provided informed consent for participation in the study. The exclusion criteria were designed to omit patients who were reported from outside Shivamogga district and those presenting with fractures other than that of the patella or with polytrauma to ensure a homogenous study population.

Data Collection Method: Information was systematically collected using a semi-structured questionnaire. The questionnaire was meticulously designed to capture the demographic profile (age, sex, occupation), which was further grouped into physically demanding labor and non-demanding labor categories to understand the potential impact of occupational stress on patellar fractures.

The clinical profile encompassed the mode of injury, which was categorized into trivial trauma (e.g., fall from standing height, slip and fall, mechanical stress fractures) and high-energy trauma (e.g., road traffic accidents, falls from a significant height). The fracture type was determined based on a wound presence, categorized as open or closed, and further classified radiologically into transverse, comminuted, vertical, and stellate types. Treatment modalities employed for the management of patellar fractures were also recorded to study the common approaches in practice.

Data Management: Collected data were coded for anonymity and managed in a Microsoft Excel spreadsheet, which facilitated efficient organization and retrieval for statistical analysis. This method

allowed for the accurate transformation of raw data into a format suitable for statistical software.

Statistical Analysis: The statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 16.0. Categorical data, such as sex distribution, type of labor, and fracture classification, were expressed in proportions and percentages. Chi-squared tests were employed to explore the associations between clinical characteristics and variables such as sex, age, and occupation. For continuous variables, such as age, means and standard deviations were calculated to summarize the data. A p-value of less than 0.05 was predetermined as the threshold for statistical significance, ensuring that the results had a less than 5% probability of being due to chance.

Ethical Considerations: Prior to data collection, ethical approval was obtained from the institutional review board or ethics committee of the hospital. Informed consent was taken from all the participants, ensuring their understanding of the study's purpose and the confidentiality of their personal and medical information.

Results

Over the period of 1 year of the study, we documented sixty-three patients that were diagnosed with patella fractures who hailed from within the district of Shivamogga and attended the orthopaedic department at Subbaiah Institute of Medical Sciences (SUIMS), Shivamogga.

The study included a total of 63 patients with patellar fractures, of whom 61.9% (n=39) were male and 38.1% (n=24) were female (Table 1).

Table 1: Socio-demographic and clinical characteristics of the patients

Variable	Frequency	Percentage
Sex		
Female	24	38.1
Male	39	61.9
Occupation		
High demanding work	32	50.8
Non demanding work	31	49.2
Laterality of fracture		
Left	16	25.4
Right	47	74.6
Mode of Injury		
RTA/ High Velocity	35	55.6
Self Fall/ trivial	28	44.4
Diagnosis with type of Fracture		
Comminuted (stellate)	20	31.8
Transverse	35	55.6
Vertical	1	1.6
Pole fractures (distal/proximal comminuted)	7	11.1
Open/Closed Fracture		
Closed	57	90.4
Open	6	9.6
Procedure		
TBW	42	66.7
Partial Pattelectomy + Extensor Mechanism reconstruction	7	11.1
Encirclage	3	4.8
Encirclage + TBW	10	15.8
Pattelectomy	1	1.6

The occupation of the participants was almost evenly split between those performing physically demanding work (50.8%, n=32) and non-demanding work (49.2%, n=31). A vast majority of the fractures occurred on the right side (74.6%, n=47) as opposed to the left side (25.4%, n=16).

In terms of the mode of injury, road traffic accidents (RTAs) or high-velocity impacts were the cause in 55.6% (n=35) of cases, while self-falls or trivial causes accounted for 44.4% (n=28) of the fractures. Radiologically, the fractures were most frequently transverse (55.6%, n=35), followed by comminuted (stellate) (31.8%, n=20), pole fractures (distal/proximal comminuted) (11.1%, n=7), and least commonly vertical (1.6%, n=1). Most of the fractures were closed (90.4%, n=57) with a smaller proportion being open (9.6%, n=6).

With regard to the treatment procedures, tension band wiring (TBW) was the most common method

utilized (66.7%, n=42), followed by encirclage with TBW (15.8%, n=10), partial patellectomy with extensor mechanism reconstruction (11.1%, n=7), encirclage alone (4.8%, n=3), and total patellectomy (1.6%, n=1).

When the clinical characteristics of patella fracture patients were assessed with respect to sex, there were no statistically significant differences found in terms of laterality of fracture (p=0.955), mode of injury (p=0.486), diagnosis with type of fracture (p=0.405), and the procedure performed (p=0.541) between males and females (Table 2).

Table 2: Association clinical characteristics of the patella fracture patients with sex

Variable	Sex		P Value
	Male (n=39)	Female (n=24)	
Laterality of fracture			
Right	29	18	0.955
Left	10	6	
Mode of Injury			
Self Fall/ trivial	16	12	0.486
RTA/ High Velocity	23	12	
Diagnosis with type of Fracture			
Transverse	21	14	0.405
Comminuted	14	6	
Vertical	1	0	
Pole fracture (proximal/distal)	5	2	
Open/Closed Fracture			
Open fracture	6	1	0.169
Closed fracture	33	23	
Procedure			
TBW	30	20	0.541
Other	9	4	

Age-related analysis showed no significant association with laterality of fracture (p=0.720), mode of injury (p=0.735), diagnosis with type of fracture (p=0.840), or treatment procedure (p=0.614) when comparing patients aged ≤40 years (n=33) to those >40 years (n=30) (Table 3).

Table 3: Association clinical characteristics of the patella fracture patients with age

Variable	Age (in years)		P Value
	≤40 (n=33)	>40 (n=30)	
Laterality of fracture			
Right	24	23	0.720
Left	9	7	
Mode of Injury			
Self Fall/ trivial	14	14	0.735
RTA/ High Velocity	19	16	
Diagnosis with type of Fracture			
Transverse	26	23	0.840
Communited	7	7	
Open/Closed Fracture			
Open fracture	2	5	0.181
Closed fracture	31	25	
Procedure			
TBW	27	23	0.614
Other	6	7	

The clinical characteristics of patella fracture patients did not show a significant association with occupation, whether it was high demanding (n=32) or non-demanding work (n=31), in terms of laterality of fracture (p=0.941), mode of injury (p=0.367), diagnosis with type of fracture (p=0.590), and the treatment procedure (p=0.805) (Table 4).

Table 4: Association clinical characteristics of the patella fracture patients with occupation

Variable	Occupation		P Value
	High demanding work (n=32)	Non demanding work (n=31)	
Laterality of fracture			
Right	24	23	0.941
Left	8	8	
Mode of Injury			
Self Fall/ trivial	16	12	0.367
RTA/ High Velocity	16	19	
Diagnosis with type of Fracture			
Transverse	24	25	0.590
Communited	8	6	
Open/Closed Fracture			
Open fracture	2	5	0.212
Closed fracture	30	26	
Procedure			
TBW	25	25	0.805
Other	7	6	

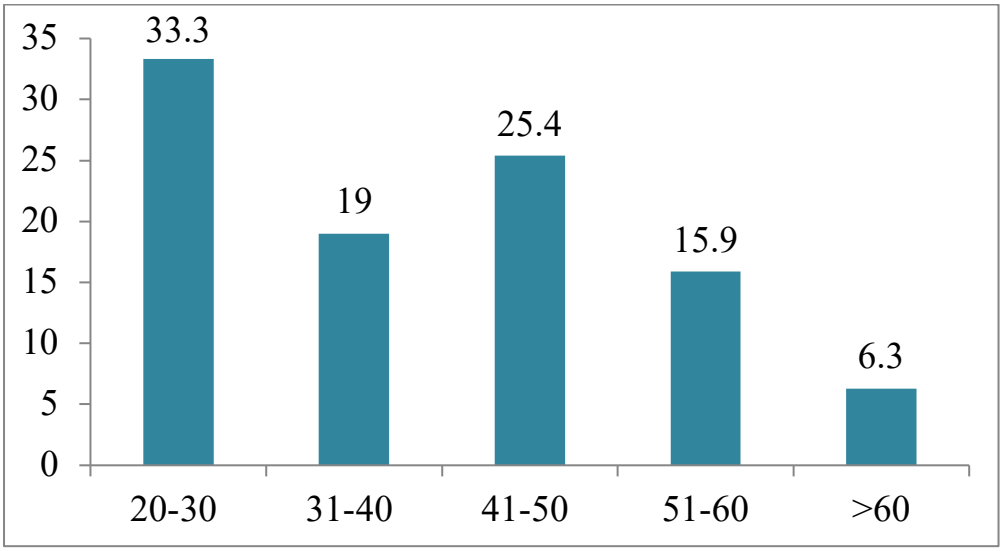

Figure 1: Bar diagram depicting distribution of patella fracture cases according to age (N=63)

Discussion

The clinical characteristics of patella fractures, as examined in this study from a tertiary care institution in South India, provide a snapshot of the current trends in patella fracture demographics, etiology, and management. With a sample size of 63 patients over a year, our findings offer valuable insights, despite inherent limitations which will be elaborated upon later in the discussion.

In this cohort, males predominated (61.9%), and the mean age of all patients was 49.9 years. These findings are in congruence with global observations where patella fractures are typically more common in men, possibly reflecting greater male involvement in high-risk activities that lead to such injuries [13]. The mean age aligns with the working population's age, suggesting that this demographic is particularly susceptible, likely due to occupational hazards or higher physical activity levels [14].

The mode of injury was predominantly due to RTAs/high-velocity impacts, accounting for more than half of the cases (55.6%). This is slightly higher than the 48.5% reported by [13] but consistent with the urbanizing landscape of India, where the increasing number of motor vehicles and traffic congestion amplify the risks of such injuries [14]. This trend towards high-velocity injuries may also reflect upon the types of fractures seen, with transverse fractures being the most common (55.6%), a figure that is comparable to the 51.9% found in other regions [13]. This could potentially be explained by the nature of impact in RTAs which often results in this type of fracture pattern.

Interestingly, comminuted (stellate) fractures, which are typically associated with high-energy

trauma, were the second most common type (31.8%). This finding contrasts with another study where falls were the predominant cause, but comminuted fractures were more prevalent (39.8%) [14]. The difference may be due to regional variations in the mechanisms of injury or differences in patient activities and behaviors.

Surgical intervention, primarily through tension band wiring (TBW), was the chosen treatment for a significant majority (66.7%). This preference for TBW reflects its established efficacy in treating transverse fractures and is corroborated by its widespread use reported in the literature [15]. The relatively high incidence of TBW in our setting could also suggest the surgeons' expertise and comfort level with this procedure or perhaps the availability of the required materials and facilities to perform this specific surgical intervention.

Our analysis also delves into the potential associations of clinical characteristics with patient demographics. Notably, no significant differences were found with respect to sex, age, or occupation, as also noted in similar studies [15,16]. These results may underscore the relatively uniform distribution of fracture types and treatment outcomes across these variables within our study population, suggesting that factors other than demographics might play a more significant role in the incidence and management of patella fractures.

However, it is critical to acknowledge the limitations inherent to this study. Being retrospective in nature, the analysis is bound by the accuracy and completeness of medical records. Moreover, the relatively modest sample size and the study's confinement to a single center may limit the generalizability of the findings. Future prospective studies with larger sample sizes and multicentric designs are warranted to validate these findings and potentially reveal more nuanced associations that could inform targeted interventions and preventive strategies.

In conclusion, our study sheds light on the clinical characteristics of patella fractures in a South Indian tertiary care setting, depicting a scenario where males in their productive years are most affected, primarily due to RTAs. Transverse fractures emerge as the most common type, with TBW being the surgical treatment of choice. The absence of significant differences across sex, age, and occupation reflects a possibly uniform risk distribution or perhaps indicates that the epidemiology of patella fractures in this region is influenced more by extrinsic factors such as traffic conditions rather than intrinsic patient characteristics. These insights pave the way for better-informed clinical practices and public health policies aimed at reducing the burden of patella fractures in South India and similar settings globally.

Conclusion

The study conducted at a tertiary care hospital in Southern India over a one-year period presents a comprehensive overview of the clinical characteristics of patellar fractures among 63 patients. The demographic distribution predominantly featured males (61.9%) with a mean age of 49.9 years. The etiology was most frequently associated with high-velocity impacts such as road traffic accidents (RTAs), which accounted for 55.6% of the cases. Transverse fractures were the most common type observed (55.6%), and tension band wiring (TBW) was the primary surgical intervention employed in 66.7% of the cases. Notably, the analysis did not reveal any statistically significant differences in fracture characteristics concerning sex, age, or occupation. These findings reinforce the notion that while patellar fractures are more common among males typically involved in outdoor and occupational activities, they do not discriminate based on age or the nature of employment. The preference for TBW as a treatment modality underscores its effectiveness and popularity in managing transverse patellar fractures.

The implications of this study are twofold. Firstly, it underscores the need for targeted interventions to prevent high-velocity injuries, particularly RTAs, in the male population. Secondly, it suggests that the current clinical practices in managing patellar fractures align with global trends, highlighting the effectiveness of tension band wiring as a treatment strategy. The study's limitations, including its retrospective nature, sample size, and single-center scope, suggest the need for further research to support and expand upon these findings.

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