

Results of Using Tension Band Wiring for the Treatment of Transverse Patellar Fractures

Sajid Younus^{1*}, Mushtaque Ahmed Shaikh², Waseem Ahmed³, Fayaz Hussain⁴, Muhammad Shuaib Chandio⁵, Suhail Wisal⁶

¹ Sajid Younus, Consultant Orthopedic Surgeon, Memon Medical Institute Hospital Karachi Pakistan.

Email: ibn_e_younus@hotmail.com

² Mushtaque Ahmed Shaikh, Assistant Professor Orthopedic Surgery, Chandka Medical college @ SMBBMU Larkana Pakistan.

Email: masortho@yahoo.com

³ Waseem Ahmed, Assistant Professor Orthopedic, Muhammad Medical college and Hospital, Ibn e Sina University Mirpurkhas.

Email: dr.waseemzubair@gmail.com

⁴ Fayaz Hussain, Consultant Orthopedic Surgeon, Provincial Headquarter Hospital Gilgit Pakistan.

Email: faiyazhussain19@gmail.com

⁵ Muhammad Shuaib Chandio, Assistant Professor Orthopedic, Shaheed Mohtrama Benazir Bhutto Medical University Larkana Pakistan.

Email: docshuaib@yahoo.com

⁶ Suhail Wisal, Consultant Orthopedic Surgeon, Khyber Teaching Hospital Peshawar Pakistan.

Email: suhail_doctor@yahoo.com

*Correspondence author: Sajid Younus (ibn_e_younus@hotmail.com)

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Abstract

Background: The patella, the largest sesamoid bone in the human body, is located inside the quadriceps tendon and has a significant impact on knee biomechanics. In contrast to most bones, it is triangular in shape, incredibly hard, and devoid of periosteal coating. The patella usually ossifies between the ages of 3 and 7 and completes throughout puberty. Approximately 1% of all skeletal injuries are patellar fractures, which primarily affect people from 20 to 50 years of age. Direct or indirect forces may be the cause of these fractures. The two main effects of a patellar fracture are possible patellofemoral joint misalignment and interruption of the continuity of the knee's extensor mechanism. **Objective:** To evaluate the functional outcomes of employing tension band wire to treat transverse patellar fractures. **Study design:** A cross-sectional study. **Place and Duration** This study was conducted at Memon Medical Institute Hospital in Karachi from July 2022 to July 2023. **Methodology:** A total of 100 people were involved in this research. All the participants in this research were those who were diagnosed with transverse patellar fractures. Patients who were involved in this study had type 1 open displaced transverse patellar fractures (>3 mm). The age of the participants in this investigation ranged from 20 to 60 years. The data was entered into Microsoft Excel and evaluated using the EPIFLO programme. For quantitative data, mean values and standard deviations were employed, while percentages were used to indicate qualitative factors. **Results:** In this study, a total of 100 participants were involved, of which 71 (71%) were male and 29 (29%) were female. The patients' ages varied from 20 to 60 years old. It was 43 years old on average. The majority of the patients belonged to the 51–60 age range. In this study, closed fractures accounted for 75% of all fractures. Within 24 hours after the injuries, 29 people underwent surgery. **Conclusion:** Tension band wiring is a safe and effective method of treating transverse patellar fractures since it can ease the postoperative rehabilitation period and offer continuous support.

Keywords

Transverse Patellar Fractures, Tension Band Wiring, Adults, Postoperative Rehabilitation.

The patella, the largest sesamoid bone in the human body, is located inside the quadriceps tendon and has a significant impact on knee biomechanics [1, 2]. In contrast to most bones, it is triangular in shape, incredibly hard, and devoid of periosteal coating [3, 4]. The patella usually

ossifies between the ages of 3 and 7 and completes throughout puberty. Typically, throughout development, one or two ossification centres give rise to three centres in about 23% of persons; these centres may not combine, resulting in the appearance of bipartite or tripartite patella in

2% of cases [5].

Approximately 1% of all skeletal injuries are patellar fractures, which primarily affect people ages 20 to 50 [6]. Direct or indirect forces may be the cause of these fractures [7]. Fractures that are directly forced often become dislocated or fractured. Indirect mechanism fractures are caused by the quadriceps muscle contracting forcefully during knee flexion. Both direct and indirect stresses are often involved in patellar fractures [8]. The two main effects of a patellar fracture are possible patellofemoral joint misalignment and interruption of the continuity of the knee's extensor mechanism [9].

Treatment options include whole patella restoration, partial removal along with tendon repair, or total removal combined with extensor mechanism repair [10]. Technological developments in surgery have resulted in a move away from patellectomy and towards techniques centred on the restoration, maintenance, and reinsertion of the extensor mechanism [11]. The purpose of this study was to evaluate the functional outcomes of employing tension band wire to treat transverse patellar fractures.

Methodology

A total of 100 people were involved in this research. All the participants in this research were those who were diagnosed with transverse patellar fractures. Patients that were involved in this study had type 1 open displaced transverse patellar fractures (>3 mm). The participants in this experiment ranged in age from 20 to 60. Written informed consent was obtained from each patient once they were informed about the research. The Ethical Review Committee approved this research.

Exclusion criteria: People with grossly comminuted fractures were not a part of this research. Moreover, those people who were medically unfit or who were having neurovascular injuries were also excluded from this study.

As soon as the patient feels pain alleviation, early knee joint therapy with partial weight bearing should be started in order to stabilise a simple transverse fracture. Exercises that target the static strengthening of the hamstring and quadriceps muscles are started right after surgery. Active flexion exercises commence in the second week, while active extension exercises start in the fourth week. Flexibility exercises are administered after three weeks if there is an accompanying extensor expansion injury and after two weeks if there isn't. Applying non-weight bearing for two weeks (or longer if concomitant injuries warrant it, up to eight or ten weeks) usually involves using a knee brace or cylinder cast. Up to the second week, or for up to eight or ten weeks if there are related injuries, partial weight bearing is permitted. Around week four, full-weight bearing normally starts. Patients are observed at follow-up appointments held the second, fourth, third, and sixth weeks after discharge. At the fourth week, third month, and sixth month visits, more X-rays are taken. Every follow-up visit includes a quadriceps strength measurement and a knee

movement.

The data was entered into Microsoft Excel and evaluated using the EPIFLO programme. For quantitative data, mean values and standard deviations were employed, while percentages were used to indicate qualitative factors.

Results

In this study, a total of 100 participants were involved, of which 71 (71%) were male and 29 (29%) were female. The patients' ages varied from 20 to 60 years old. It was 43 years old on average. The majority of the patients belonged to the 51–60 age range. In this study, closed fractures accounted for 75% of all fractures. The distribution of patients by age group is displayed in Table 1.

Table No 1. Distribution of Patients by Age Group.

Age group (Years)	N
20 to 30	20
31 to 40	18
41 to 50	20
51 to 60	42

Table number 2 shows the good fellows grading of range of motion.

Table No 2. Good Fellows Grading of Range of Motion.

Grading	Range of motion	Grading
Poor	Limitation of >40 degrees flexion	Poor
Satisfactory	Painless movement with a limitation of 20-40 degrees of flexion	Satisfactory
Fair	Limited flexion, painless movement with 10 to 20 degrees	Fair
Good	Painful squat but full flexion	Good
Excellent	Able to squat, full painless movement	Excellent

Table number 3 shows the outcomes according to the good fellows grading.

Table No 3. Outcomes According to The Good Fellows Grading.

Grading	N	%
Poor	0	0
Satisfactory	0	0
Fair	15	15
Good	22	22
Excellent	63	63

Table number 4 shows the timing of the surgery of the participants when they were operated after their injury. 29 patients were operated on within 24 hours of injury.

Table No 4. Timing Of the Surgery of The Participants.

Timing of surgery	N	%
Within 24 hours	29	29
25 to 72 hours	46	46
73 hours to 1 week	22	22
After 1 week	3	3

Discussion

Restoring the extensor mechanism, protecting the patellar bone, restoring the correct joint surface, and achieving exact alignment are the main objectives of surgical intervention for patellar fractures. The most often used technique for treating transverse patellar fractures is tension band wiring [12, 13].

According to research by Dudani and Sancheti, 73% of patients treated with tension band wiring for patellar fractures were able to achieve flexion beyond 120 degrees [14]. In a study with thirty cases of patellar fracture, Levack B. et al. found that the average age was 49 years old [15]. Nine fractures were found in females among these instances, compared to 21 fractures in males. According to the study, men were more likely to experience trauma, most likely as a result of their increased outside activity. The results of modified AO tension band wiring, which combined cerclage wiring with tension band procedures, were assessed by Curtis M. J. et al. [16].

Modified tension band wire was found to produce a stronger fixation than previous techniques when Benjamin et al. investigated numerous fixations for transverse patellar fractures [17]. Smith et al. treated 49 of the 51 patients in their study with modified tension band wiring and the other 2 patients with tension band wires threaded through cannulated cancellous screws [18]. The patients had patellar fractures. The data show that about 90% of the patients had excellent results.

Burvant et al. conducted a study comparing the effectiveness of tension band wiring with circular wire surrounding the bone for fracture repair [19]. According to their findings, instances treated with tension band wiring showed better stability and stronger fixation than those treated with circular wire fixation. In research by Ndiaye et al., 26 patellar fracture cases were treated; 18 of the cases were treated with modified tension band wiring, while the remaining instances were treated with circular wire fixing [20]. According to their research, the earlier technique had superior results, especially in cases of transverse fractures or crushing injuries that affected the patella's middle region.

Conclusion

Tension band wiring is a safe and effective method of treating transverse patellar fractures since it can ease the postoperative rehabilitation period and offer continuous support.

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Conflict in the interest

Nothing to declare.

Permission

It was taken from the review committee.

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