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**Original Research Article**

# Outcomes and Evaluation of Patelloplasty using Delayed Absorbable Suture Materials of Displaced Patella Fracture

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## Abstract

***Introduction:*** Surgical attachment of displaced patella fractures is now the international standard treatment. The non-absorbed braided suture fixation group's study goal is to measure clinical, radiological, and functional findings as well as to detect complications of patellar fractures. As a control group, these patients were compared to those who had mid-substance fractures and were treated with K-wire or canceled tension strip wiring. ***Methods:*** From January 2018 to December 2020, a multicenter nonrandomized quasi-experimental prospective study was conducted in Rajshahi Medical College Hospital and Sador Hospitals in Rajshahi Division (Joypurhat & Sirajganj) Bangladesh. The total number of patients was *n=108* The mean age was 36.28 years ranging from 20 to 60 years. All patients are treated with delayed absorbable suture wiring without using hardwiring of the fractured patella. The outcome was assessed by the Böstman scoring system. All demographic data including injury and surgical data were also documented. In all of the patients, non-absorbable sutures were twisted through the patellar tender and drilled to decrease and fracture the patella. ***Results:*** A total of 108 individual patients with patella fracture were treated prospectively over 2 years. 78 patients were male. The male-female ratio was 2.6: 1. Their mean age was 36.28 years ranging from 20 to 60 years. 57 (52.78%) patients were injured at right and 51 (47.22%) affected on the left side. The mean injury surgery interval was 2.0 days ranging from 2-8 days and their mean hospital stay was 4 days. We have found all patients in our schedule follow-up system and most of the patient's 103 (96.14%) knee ROM were 120 degree. Only 5 (3.86%) patients' Knee ROM found 90-120 degree. Most of the Patient 103 (96.14%) had come back to their daily works. Our assessment was done with the Böstman scoring system and we have found satisfactory results (Excellent and good) 103 (96.14%) patients and unsatisfactory (fair and poor) results 5 (3.86%). Only 2 (1.85%) patients had SSI out of them one patient was needed revision surgery and their result was unsatisfactory. ***Conclusions:*** In individuals who sustain lower polar patella fractures, fraction fixation options are limited. Suture repair that is clinically acceptable and produces results that are comparable to metal implant patella fractures. Suture repair patients appear to have fewer postoperative hardware-related problems than those who have midsole fracture wire fixation.

**Keywords:** Patella fracture, suture fixation, wire fixation, Rajshahi Medical College Hospital.



## INTRODUCTION

1% of all emergency departmental fractures comprise Patella fractures which require an operation of only one-third of those fractures [1, 2] Approximately 20% of surgically treated satellite fractures include the lower satellite point [3]. There has historically been a debate between resection and fixation of the lower pole versus surgery. Current clinical and biomechanical studies have shown that resection distorts the extensor mechanism by lowering the knee joint's lever arm [4, 5]. The standard of treatment for these injuries has now become the operational fixation of displaced patella fractures [6].

The modified anterior tension strip technique with K- wires are the most commonly used technique for treating simple midsole patella fractures (K-wires). While K-wire the Tension Band is still widely used, patients frequently complain about prominent hardware,

which leads to a high rate of the hardware removed (ROH). Additional methods, such as fixed angle platforms and basket platens, were developed for use with distal polar fractures [7-9]. These alternatives must still replace tension belting technologies, which are still used in gold standard fracture treatment [10,11]. Moreover, some polar fractures comminuted and lower cannot be adapted to standard fastening techniques. Recent studies have shown that sutures such as 5-Ethibond and fiber wire are similar to stainless steel wires [12-14] but avoid irritation. This study is aimed at quantifying clinical, radiographical, and functional results and identifying complications of inferior polar patellar fractures in the non-absorbed braided suture fixation cohort. These patients were then compared to a control group of patients who were treated with K-wire or cancellated tension strip wiring for mid-pole fractures. We assume that the results between the two groups will not be observed.

## METHODS

A multicentered nonrandomized quasi-experimental prospective study was conducted in Rajshahi Medical College Hospital and Adunic Shador Hospital in Rajshahi Division, Bangladesh, which identified 108 patients who had 108 patella fractures displaced and who had been operated on during nine years (2018-2020). The records have included demographics of patients, the pattern of injury and the mechanism, surgical information. Each patient was followed in standard intervals by the treating surgeon. The following visits included radiographs functional data. For all of the patients, the same postoperative regimen was employed, as well as standard follow-ups. Data were obtained at the same time during the follow-up visits. A control group with mid substances patellar fractures has been treated with K-wires and tension band technology or cannulated screws was found as a comparison. Patients were monitored by the treating surgeon at regular intervals. Self-reported function and movement of the knees on the unaffected side were among the findings.

A standard suture repair surgical technique was used. In a Krackow-like fashion with four proximal sutures, two non-absorbing sutures were positioned. The long axis of the patella was formed by three longitudinal boiling holes. Suture ends were crossed with a beath needle through the boxes and then fetched with a tenaculum clamp above the box (Figs 1a,1b and1c). Afterward, a tenaculum clamp was used. 1c). Intraoperative image intensification was confirmed for the correction of patella Alta and the reduction of fractures. All patients were permitted to carry extended weight in a knee immobilizer for six weeks after surgery. Six weeks of knee movement were restricted. Radiographs for the healing of fractures have been obtained at standard intervals. To objectively quantify knee function and to assess general well-being Scale 16 scores of Lysholm Knee Score [15] and Tegner Activity Scale [16] were obtained. At follow-up visits, data were collected.

**Fig-1a: Patient with lower polar patella fracture Lateral view**

**Fig-1b: Sutures are made in Krakow and pass through the hole with the Beath needle made longitudinally in the patella**

**Fig-1c: Picture sutures are tied to the top of the patella after reduction**

In the comparison, we used a control group of patients who were treated by a K-wire or canceled screws and a wire tension tape technology, with a mid-polar patella fracture. In figure eight, a modified AO technique crossed the predicted road surface, which is higher than the tension of knots. Patients had their surgeon's treatment followed up, and uninjured patients compared results such as self-reported function and knee motion. Statistical comparison based on the exact test and t-test of Fisher with a threshold of importance p=0.05.

## RESULT

A total of 108 individual patients with patella fracture were treated prospectively over 2 years. 78 patients were male. The male-female ratio was 2.6: 1. Their mean age was 36.28 years ranging from 20 to 60 years. 57 (52.78%) patients were injured at right and 51 (47.22%) affected on the left side. The mean injury surgery interval was 2.0 days ranging from 2-8 days and their mean hospital stay was 4 days. We have found all patients in our schedule follow-up system and most of the patient's 103 (96.14%) knee ROM were 120 degree. Only 5 (3.86%) patients' Knee ROM found 90-120 degree. Most of the Patient 103 (96.14%) had come back to their daily works. Our assessment was done with the Böstman scoring system and we have found satisfactory results (Excellent and good) 103 (96.14%) patients and unsatisfactory (fair and poor) results 5 (3.86%). Only 2 (1.85%) patients had SSI out of them one patient was needed revision surgery and their result was unsatisfactory.

We found 108 patients receiving 108 surgery-treated patella fractures throughout 2 years, between 2018 and 2020. This cohort comprised 78 women (72.32%) and 30 men (27.68%) aged 57,1 years on average (range 20 - 65 years). The suture fastening in the thirteen patients was performed on the 66 lower pole fractures of the patella (Fig. 1) and 42 patients with K-wire and cannulated screw- and wire-tension band fastening in the region of the midsole (Fig. 2). One patient had a failed initial fixation of the suture cohort 1 (1.08%). The revision operation consisted of lower patellectomy and progression of patella tendons. Of the 42 patients with band fixation, 02 were subjected to secondary operation due to hardware or failure 2 (1.95%). Hardware deletion was done at 46 weeks on average. The abovementioned results are nonetheless not statistically significant (p=0.14) although clinically relevant. No re-operations were necessary for any patient with a cannulated screw and tension bands (p=. 016). All secondary operations have been done in K-wire-treated patients. In either cohort, no infections have been reported.

**Fig-2: Post operative X Ray**

Every fracture healed x-ray at one year. The knee range of functional value (Lysholm and Tegner scores) of the two cohorts was not significantly different. The patients with wire fixation were lower than the sutured lower polar fractures 66 (61.58%) (p=0.03). The knee moving arc was significantly decreased (means 113 degrees) compared with those who did not (mean 126 degrees) for patients with preoperative or postoperative complications (p = 0.005) Finally, the wounded knee of patients who require hardware removal decreased considerably more in the range of motion than those patients who do not require hardware removal compared to the contralateral knee (p=.005).

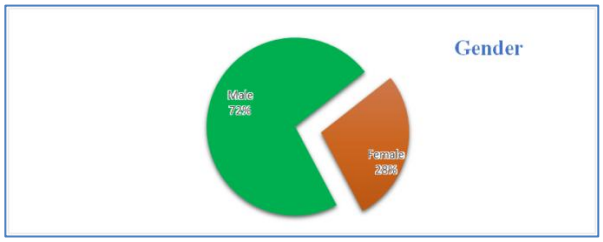


**Fig-3: Diagram showing the gender distribution (n=108)**

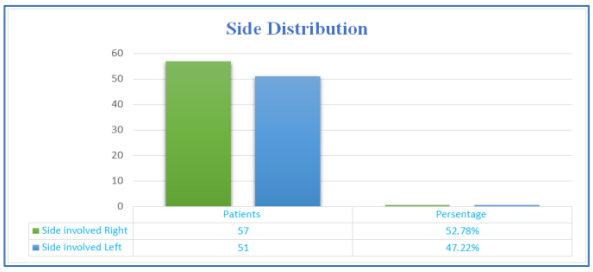


**Fig-4: Diagrams showing the side distribution of injured (n=108)**

**Table-1: Range of movement (ROM) study patients by knee flexion (n=108). [Böstman scoring system]**

| Range of movement (ROM) | Number of cases | Percentage |
|---|---|---|
| Full-extension, movement 90° to 120° | 05 | 3.86 |
| Full extension and the ROM >120° | 103 | 96.14 |
| Total | 108 | 100.0 |

**Table-2: Pain [Böstman scoring system] (n=108)**

| Pain | Number of cases | Percentage |
|---|---|---|
| None or minimal on exertion | 103 | 96.14 |
| Mild, Occasional | 03 | 2.18 |
| Moderate on exertion | 02 | 1.68 |

**Table-3: Work [Böstman scoring system] (n=108)**

| Daily activity | Number of cases | Percentage |
|---|---|---|
| Original job | 103 | 96.14 |
| Different job | 05 | 3.86 |
| Cannot work | 00 | 00 |

**Table-4: Atrophy, difference of circumference of thigh 10 cm proximal to the patella. [Böstman scoring system] (n=108)**

| Atrophy, difference of circumference | Number of cases | Percentage |
|---|---|---|
| <12 mm | 103 | 96.14 |
| 12 to 25 mm | 04 | 2.78 |
| >25 mm | 01 | 1.08 |

**Table-5: Assistance in walking [Böstman scoring system] (n=108)**

| Walking | Number of cases | Percentage |
|---|---|---|
| None | 103 | 96.14 |
| Cane part of the time | 05 | 3.86 |
| Cane all the time | 00 | 00 |

**Table-6: Giving way [Böstman scoring system] (n=108)**

| Giving way | Number of cases | Percentage |
|---|---|---|
| None | 103 | 96.14 |
| Sometimes | 05 | 3.86 |
| In daily life | 00 | 00 |

**Table-7: Stair-climbing [Böstman scoring system] (n=108)**

| Stair-climbing | Number of cases | Percentage |
|---|---|---|
| Normal | 103 | 96.14 |
| Disturbing | 05 | 3.86 |
| Disabling | 00 | 00 |

**Table-8: Final Outcome total score [Böstman scoring system] (n=108)**

| Total score | Number of cases | Percentage |
|---|---|---|
| Excellent | 82 | 76.82 |
| Good | 21 | 19.32 |
| Unsatisfactory | 05 | 3.86 |

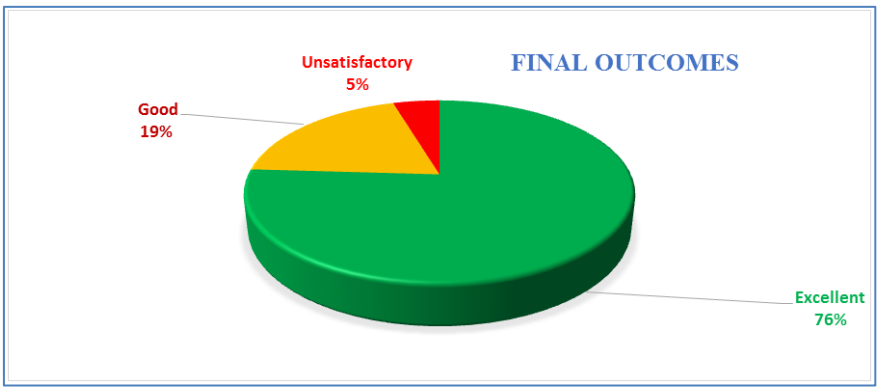


**Fig-5: Diagram showing the final outcome. (n=108).**

**Table-9: Distribution complications (n =108).**

| Complications | Number of cases | Percentage |
|---|---|---|
| No complications | 103 | 96.14 |
| Surgical site infection (SSI) | 02 | 1.85 |
| Pain (intermittent pain) | 03 | 2.01 |
| Total | 108 | 100 |

Table-9 shows the complications rate of the patients, 3 (2.01%) patients' pain and 02 (1.85%) had a surgical site infection (SSI), and 103 (96.14%) had no complications.

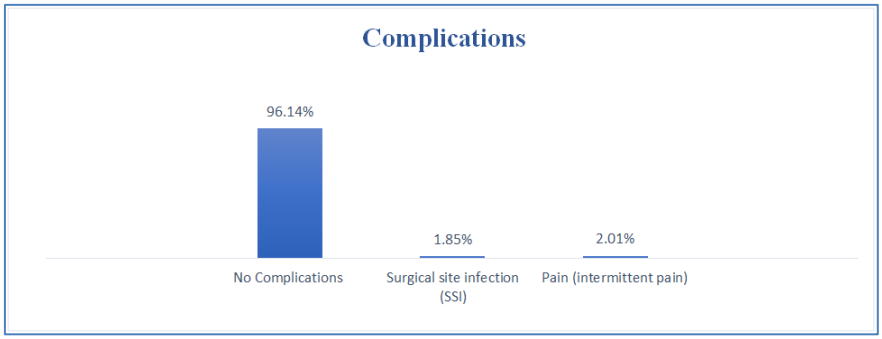


**Fig-6: Diagram showing the complications rate of the patients (n=108)**

**Distal Procedures**

Because of the presence of an open apophysis of the tibial tuberosity, efforts for correction of an abnormal Q- angle or tibial tuberosity: trochlear groove distance as well as efforts to correct patella Alta are problematic and cannot be addressed by osteotomy. One established technique to address an abnormal Q-angle has been the Roux-Gold worth procedure [17], There are concerns, however, that the medial transfer of the lateral half of the patellar tendon may result in the abnormal spin of the patella as well as the posterior positioning of the transfer possibly resulting in increased patellofemoral pressures. With this in mind, Kraus et al35 have described a modified technique from Grammont that strips the distal patellar tendon from the apophysis but maintains a periosteal connection distally. Subsequently, with knee flexion/extension, the tendon is allowed to seek a new and more neutral alignment.

## DISCUSSION

There are limited options for fraction fixation in patients who sustain lower polar patella fractures. Clinically acceptable and biomechanically verified suture repair [18,19], and results similar to those obtained from midsole patella fractures with metal implants in our study were reported. In our study, patients in suture repairs had less after-operative hardware and obtained higher SF-36 composite scores at a follow-up period of one year. For patients with standard belt fixation, four times higher than in suture fixation was the reoperation rate. This result is consistent with other reports that show an increased patient reoperation rate [20,21].

Partial patellectomy continues to be an option for treatment of inferior polar comminuted fractures but this therapy can lead to patella Baja, defined by an index install-Salvati less than 0.6 [11, 22]. Not only may patients report discomfort, but the patellofemoral joint [23] can also lose proper function as a result of patellofemoral arthritis [24]. This is confirmed in a study by Hung et al. on partial patellectomies, which notes that in 55% of the retrospectives and many patients' x-rays arthritis is found [25].

Reoperation rates have been reported between 20 and 50% following the use of Kirschner wires [20, 21, 25] before the study on Patella Fracture Fixation. A recent 2-year study meant that LeBrun follow-up reported 56 percent in a cohort similar to the one used in our research [27]. Interestingly, every removal of equipment in our study has taken place with the K-wire group which accounted for 93% of all reoperation in the cohort. In a sub-set of cannulated screws and tension band cables, no removal of hardware was necessary. Similar to a Tian study, which did not show postoperative complications for the canceled skeleton group, this discrepancy between removal of hardware rates for K-wire and the canceled squeeze is a 20% removal of hardware rates in the K-Wire fixation group [21]. Our study has also shown that the range of movements within the affected knee of patients requiring reoperation has been significantly restricted and remained significant after exclusion.

Although a previous study examined the use of K-wire fixation with #5 Ethibond Suture [20], quantitative methods have never been used to measure the result of the patient. Our study used accepted results measures to quantify differences between the two groups and basic diagram surveys. The aforementioned studies with rigorous outcome metrics, like LeBrun, et al., and Tian, et al., did not include a cohort treated with

sutures. The basket plate studies, including Huang's recent case series, are specific to lower fractures of poles but are restricted by their small cohorts [9] or pole resection control [24] - a method less than osteosynthesis because of reduced movement range and the increased incidence of patella Baja [25]. 64 percent of patients receiving internal fixation were hardware removed in a study using Kastelec et al. basket plates. Although the authors do not report any significant functionality differences between hardware patients and hardware-retaining patients, no standard results measure has been used to compare the two groups.

In our study, we limit the statistical analysis to a small patient population. The decision was made only by fracture pattern which could create a selection bias. There was no algorithm to determine the type of fixation. Usually, a simple two-part fracture with large fragments with cannulated screws was fixed, a K-wire tension band was attached to a conveyor fracture and a suture was applied to small, lower poles. Finally, the retrospective nature of our analysis is not ideal for a rigorous comparison of the two surgical methods. Despite this, our inclusion of quantitative outcome measures supported and expanded upon qualitative conclusions of previous studies.

This study demonstrates that mid-pole patella and inferior pole patella fractures treated surgically compared similarly with regards to knee outcome scores, range of motion, and healing. Distal pole fractures treated with suture technique did not necessitate removal of hardware whereas some patients in the tension band cohort required another operation.

## CONCLUSIONS

The surgical management of young & adult Suture fixation was also associated with a lower overall reoperation rate. Our results show that distal poles with heavy woven non-absorbed suture fixation are successfully treated and that these results are even or better than wire fixation for mid pole fractures.

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