

Tension Band Wiring in Gap Non-union Patella – A Simple Technique with Profound Results: Case Report

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Learning Point of the Article:

The present case report highlights the benefits of using the simple and cost-effective technique of tension band wiring to achieve good reduction, fixation, and an optimum functional outcome while managing the gap non-union patella.

Abstract

Introduction: Gap non-union patellas are challenging to treat for an orthopedic surgeon. We hereby report a case of a 22-year-old person with a 3 cm gap nonunion, its surgical management, functional outcome, and implications for clinical practice.

Case Report: A 22-year-old active male presented to us with a background of comminuted fracture patella left side that he suffered 1 year ago, following which he was treated by open reduction and internal fixation (ORIF) with Tension Band Wiring (TBW). One year post-surgery, the patient had another fall, following which he had pain swelling in his left knee and difficulty in his knee extension. The patient presented 6 months later with painful ambulation and a swelling left knee. A 3 cm gap along with underlying implants could be palpated. The patient underwent surgery in the form of previous implant removal, freshening and apposition of fracture ends, and single-staged reconstruction of the extensor mechanism using TBW. The patient had full range of motion at the 1-year follow-up.

Conclusion: The present case highlights the fact that small-gap non-union patella can be managed simply as a single-stage procedure with ORIF and TBW.

Keywords: Fracture patella, non-union, tension band wiring

Introduction

Fracture patella rarely progresses into non-union as patella is a sesamoid bone and is managed mostly with early surgical intervention. The management of non-union patellas is still a challenge in orthopedic practice. The incidence of non-union patella as quoted in the literature is 2.7–12.5% [1]. The quadriceps muscle attached at the proximal end pulls the proximal fragment more proximally, resulting in a gap at the fracture site. This leads to failure of the quadriceps mechanism, which causes patients to seek treatment for patellar non-union. Various modalities of treatment of nonunion patella are available,

e.g., apposition of fracture fragments and fixation with TBW Traction of the proximal fragment followed by definitive surgery—a two stage procedure, Quadricepsplasty followed by surgery – a single-stage procedure, Gradual docking using the Ilizarov apparatus— is a single-stage procedure and rarely a partial or total patellectomy. In the present case, a 3 cm gap non-union left patella was managed by open reduction and internal fixation (ORIF) with tension band wiring (TBW).

Case Report

A 22-year-old active male presented to us with a background of

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Author's Photo Gallery



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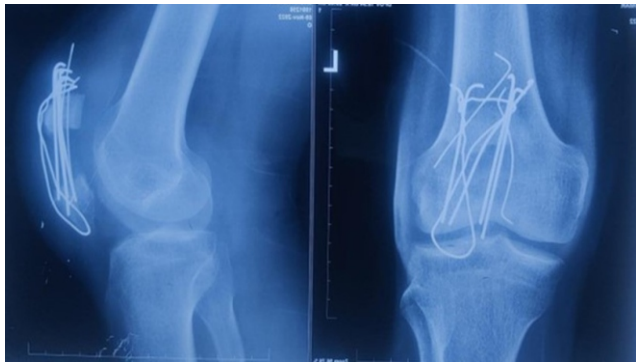


Figure 1: X-ray anterior-posterior and lateral view showing gap non-union patella.

comminuted fracture patella left side that he suffered 1 year ago, following which he had been treated by ORIF with TBW. The patient was ambulatory 2 months after this surgery and had achieved full range of motion in the knee by 8 months post-operative. One year after index surgery, he suffered another fall from the stairs, following which the patient had pain swelling in his left knee with difficulty in his knee extension. The patient continued to remain ambulatory, albeit with difficulty. He presented to us 6 months later with painful ambulation and a swelling left knee. On palpation of the knee anteriorly, a 3 cm gap along with underlying implants could be palpated. Inability to perform a straight leg raising test with an extensor lag of 45° was noted, indicating loss of function of the extensor mechanism, although active knee flexion up to 90° was evident. A plain radiograph of the left knee demonstrated a gap of 3 cm (Fig. 1 and 2). Implant removal, freshening, and apposition of fracture ends and single-stage reconstruction of the extensor mechanism using TBW were done (Fig. 2). The release of the extensor mechanism was not required, as the apposition of non-union fragments was achieved with gentle traction on the proximal patella non-union fragment in a distal direction. Patient had full ROM at 1 year follow-up with a Knee Society



Figure 2: Clinical pic following first surgery.

score of 98 (Fig. 3-7).

Discussion

Management of gap non-unions of patella is a challenge to treat. Non-compliant patients, delayed patient care, previously failed surgery, geographical inaccessibility, and financial constraints are the various reasons why this rare condition is still commonly seen [2]. Non-operative management in the form of observation, activity modification, physical therapy, and local pain-relieving measures has been advocated in a select group of patients with low functional demand [3], but a torn extensor retinaculum or quadriceps contracture leading to a high-riding proximal patellar fragment makes surgical management mandatory [4]. Moreover, an intact extensor mechanism is a lever for knee extension; hence, its integrity is desirable in high-functional-demand patients.

The aim of treatment for Gap Non-union Patella is to bring proximal and distal fragments together to achieve osteosynthesis. If there is associated quadriceps contracture, then a single-stage procedure like V-Y plasty [5], pie crusting of quadriceps [6], followed by TBW [7], and Ilizarov ring fixator



Figure 3: Post-operative X-ray following second surgery.



Figure 4: Clinical pics at 1 year follow up.



Figure 5: Clinical pics at 1 year follow up.



Figure 6: Clinical pics at 1 year follow up.

are done. Otherwise, a two-stage procedure like pre-operative skeletal traction [1] to bring the proximal fragment to the desired level, followed by approximation, of fracture fragments and internal fixation at a later date, is also possible (Table 1).



Figure 7: Follow-up X-ray following second surgery.

The literature is ambiguous regarding the best option to bring the high-riding proximal patella to a normal level for apposition with the distal fragment. Some studies

have reported good results with quadricepsplasty [5], while others have preferred skeletal traction to proximal fragment patella over quadricepsplasty, as quadricepsplasty may lead to extensor lag and quadriceps contracture [8].

Mahajan et al. [6] have mentioned pie crusting of quadriceps or V-Y plasty followed by fixation with encirclage wire or TBW gives a good functional outcome in gap non-union patella, while other studies have advocated pre-operative patellar traction followed by TBW as a better alternative to either V-Y plasty or patellectomy [8].

Once the proximal and distal fragments of the patella are in apposition, TBW is a cheap and effective way to achieve osteosynthesis.

Another treatment modality, i.e., patellectomy, as a treatment option for gap non-union patella has also been mentioned [9].

TBW and patellectomy have been compared in a study for gap non-union of the patella. Out of twenty-two patients with neglected fractures of the patella, TBW was done in 16 cases, TBW with cerclage in three cases, and patellectomy in three cases [9]. Patellectomy procedures are best avoided as the efficiency of the extensor mechanism is reduced by 30% in patellectomy patients [9], leading to extension lag and poor functional outcomes [5]. Moreover, the length of the lever arm of the external apparatus mechanism is also compromised, causing excessive stress on the knee joint during extension,

Authors	Cases	Presentation	Procedure	Results	Conclusion
Baruah 2016 [10]	1	Failed osteosynthesis following TBW	Gradual docking using Ilizarov	Full ROM	Gradual docking using Ilizarov fixator and subsequent compression beneficial
Bhimani et al. 2018 [5]	1	Non-union patella with quadriceps contracture secondary to trauma × 6 months The superior fragment - distal third thigh, lower fragment close to the tibial tuberosity.	Quadricepsplasty with double tension band wiring.	ROM Knee 110 °	Quadricepsplasty -one of the good modalities of treatment for the non -union patella associated with quadriceps contracture.
Al-Obaedi et al. 2019 [1]	1	12 cm Gap non -union patella	Ring fixator traction followed by TBW	Full ROM Knee	Ring fixator with wires through the patella and quadriceps tendon in the first stage and definitive TBW in second stage - a viable option
Harna et al. 2021 [7]	10	Gap non-union (5.2 cm)	Transverse fractures - ORIF and TBW, Comminuted fractures -ORIF with TBW + cerclage wire,	Mean union 5 months (3 –6 months)	ORIF with TBW - best results non -union patella.
		Transverse 5, Comminuted 2, Inferior pole patella 3.	Inferior pole patella -OR and Krackow suture using fibre wire.	No extension lag in 6 patients at 6 months.	V-Y plasty rarely required for fracture reduction.
				ROM 1 year -10°-110°.	Krackow suture technique helpful in inferior pole patella fractures.
Mahajan et al. 2022 [6]	1	Failure of quadriceps mechanism and extension lag. Gap non-union> 5 cm	Pie crusting and V-Y plasty Quadriceps with TBW and circlage wire	3 mo post-operative -Flexion 90 °, No extension lag, Bony union at 3 months follow up.	Quadriceps mobilization with pie crusting V Y plasty and fixation with encerclage wire, TBW - a good functional outcome
Garg et al. 2012 [8]	14	14 patients - traumatic OA, 13 - previously treated with plaster cast, rest no treatment. The average gap - 5 cm, Two part non-comminuted transverse fractures.	V-Y plasty with TBW, Patellar traction followed by TBW, Patellar traction followed by partial or total patellectomy	V-Y plasty with TBW-Worst results	Pre-operative patellar traction followed by TBW - better results than either V -Y plasty or patellectomy
				Patellar traction with TBW	
				ROM at one year=130 °	
				Infection=6.6%, Persistent pain= 6.6%, Extensor lag=6.6%	
				Patellectomy	
				ROM at one year=110 °	
				Patellectomy	
1) Persistent pain=20%					
2) Extensor lag=40%					
ORIF: Open reduction and internal fixation, TBW: Tension band wiring					

Table 1: Relevant literature.

leading to subsequent degeneration of the knee joint [5].

Two-ring ilizarov has emerged as a popular single-stage procedure that does not require quadricepsplasty but works on the principal of a gradual quadriceps stretch and subsequent docking of patellar fragments. Definitive fixation is achieved with these devices after the gradual docking of fracture fragments [10].

Above is a brief review of the many approaches mentioned in the literature to address the gap non-union of the patella. While the present patient had a gap non-union of 3 cm, and proximal fragment was easily reducible to distal fragment, no proximal fragment traction or quadricepsplasty was required.

The patient was managed by apposition of fracture fragments and TBW.

Conclusion

The simple technique of single-staged TBW with extensor mechanism repair for the management of non-union patella fractures is a simple and cost-effective way of restoring the extensor mechanism in a select group of patients. Our case shows that a good functional outcome is achievable without the need for a V-Y quadricepsplasty or a patellectomy, provided there is no quadriceps contracture.

Clinical Message

Treatment of Gap non-union patella remains a challenge in orthopedic practice. The present case will help orthopedic surgeons consider TBW, a simple and cost-effective technique, as a viable treatment option for these injuries.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None



References

1. Al-Obaedi O, Thakrar RR, Kundra R, Iqbal MJ. Gap non-union patella fractures: Case report and review of the literature. *J Orthop Case Rep* 2019;9:69-71.
2. Singhal V, Mittal D, Lal H, Khare R, Sharma S. Gap non-union patella: A treatment dilemma. *Pb. J Orthop* 2010;12:8-11.2
3. Nathan ST, Fisher BE, Roberts CS, Giannoudis PV. The management of nonunion and delayed union of patella fractures: A systematic review of the literature. *Int Orthop* 2011;35:791-5.
4. Carpenter JE, Kasman RA, Patel N, Lee ML, Goldstein SA. Biomechanical evaluation of current patella fracture fixation techniques. *J Orthop Trauma* 1997;11:351-6.
5. Bhimani R, Singh P, Bhimani F. Double-tension wire management of nonunion patella with severe quadriceps contracture. *Case Rep Orthop* 2018;6:1364129.
6. Mahajan NP, Kondewar P, Ghoti S, Chaudhari K, Gund A. Management of a gap non-union patella fracture using encirclage wire and tension band wiring with Quadriceps V-Y Plasty in an elderly patient: A rare case report and review of literature. *J Orthop Case Rep* 2022;12:95-8.
7. Harna B, Gupta P, Singh J, Rousa S, Gupta A. Surgical management of non-union patella fracture: A case series and review of the literature. *Arch Bone Jt Surg* 2021;9:554-8.
8. Garg P, Sahoo S, Satyakam K, Biswas D, Garg A, Mitra S, et al. Patellar nonunions: Comparison of various surgical methods of treatment. *Indian J Orthop* 2012;46:304-11.
9. Uvaraj NR, Mayil Vahanan N, Sivaseelam A, Mohd Sameer M, Basha IM. Surgical management of neglected fractures of the patella. *Injury* 2007;38:979-83.
10. Baruah RK. Modified ilizarov in difficult fracture of the patella. A case report. *J Orthop Case Rep* 2016;6:26-8.

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