Original article

Habitual patellar dislocation in children: Results of surgical treatment by modified four in one technique

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ABSTRACT

Background: Habitual patellar dislocation is a rare condition affecting children. The growth plates are open in children and any surgical intervention should take that in to consideration. We are describing a modified four in one technique for habitual patellar dislocation, which is a soft tissue procedure without the use of any implant.

Method: In this study we included 6 children (4 females and 2 males) with open growth plates, which were diagnosed with habitual patellar dislocation. The average age of the patients were 9.6 years (range 5–13 years). Our technique included lateral retinaculum release, vastus medialis obliques (VMO) advancement, partial patellar tendon transposition and reconstruction of medial patellofemoral ligament (MPFL). Patients were evaluated with Kujala scoring pre and post operatively. The average follow up period was 12 months (range 7–24 months).

Results: There were no recurrence of patellar instability in any of the cases. The mean Kujala score was 48 before surgery and it improved to 95 after 12 months of average follow-up after surgery.

Conclusion: We conclude that our method of treatment of habitual patellar dislocation by using modified four in one technique in children with open physis reproduced excellent functional outcome. It is simple, cheap and does not require any image guidance.

Therapeutic study: Level of evidence IV.

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1. Introduction

Habitual patellar dislocation is a rare condition in which patella dislocates on each attempt at knee flexion.¹ This condition is different from the recurrent patellar dislocation in which patella dislocates episodically. Different treatment modalities are described in the literature for the treatment of habitual patellar dislocation with their own merits and demerits.² This ailment is common in children with open growth plate. Multiple factors are responsible for causing habitual patella dislocation like contraction of lateral patellar soft tissue, lateral femoral condyle hypoplasia, patella alta and ligamentous laxity^{3–6} and this is the reason why many authors had advocated a combinations of surgical procedures in its management.^{7–9} Joo et al. published a four in one technique consisting of lateral retinacular release, semitendinosus tenodesis, Roux Goldthwait partial patellar tendon transposition and proximal tube realignment of patella in patients

with habitual patellar dislocation.^{10,11} We modified this four in one procedure by reconstructing medial patello femoral ligament by modified Yercan method and transposing VMO distally and laterally, in place of proximal tube realignment of patella.¹²

2. Methods

In this study we included six children with habitual patellar dislocation. All the included patients had open physis and were not operated previously for habitual patellar dislocations. Children with recurrent patellar dislocation, previously operated knees, congenital dislocations and fixed dislocations were excluded. We also excluded patients with genu valgum and torsional deformities of tibia and femur. Kujala scoring was used to assess the knee functions pre and post operatively in these children.¹³ Radiological evaluation consisted of anteroposterior, lateral and Merchant's view radiographs of knee.¹⁴

2.1. Surgical procedure

All the surgeries were performed by a single surgeon. After anaesthesia, patients were positioned supine and tourniquet was

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applied on thigh. Midline skin incision given centering over the patella. Medial and lateral subcutaneous flaps were raised and medial arthrotomy was done. VMO and insertion of adductor magnus tendon on adductor tubercle were identified. Extensive lateral retinacular release was done. Vastus lateralis was released from the lateral intermuscular septum up to the junction of proximal and mid thigh. The retinaculum was released distally up to the tibial tuberosity (Fig. 1). One or two transverse incisions in the distal tendon of vastus lateralis were also required to decrease the lateral pull on the patella. The transverse incisions did not compromise the integrity of the tendon. Patellar tendon was split in the centre and lateral sleeve was incised from the tibial attachment. Gracilis tendon graft was harvested as a free graft. A transverse drill hole was made at the mid point of patella, parallel to patellar articular surface, from medial to lateral direction using 4.5 mm drill bit. Gracilis graft was passed through patellar tunnel in medial to lateral direction and brought back on medial side by passing over anterior patellar surface. Graft was secured over the anterior patellar surface medially and laterally using Ethibond No 2 sutures. With vicryl No 1–0 sutures the two ends of the graft were sutured to one another at medial aspect of the Patella (Fig. 2). A tunnel was made between the capsule and VMO and graft was passed through it (Fig. 3). Then the graft was passed under the adductor magnus tendon and brought over it (Fig. 4). The graft was sutured to itself with Ethibond No 2 sutures in 30 degree of knee flexion. Lateral half of patellar tendon was transposed medially as described by Roux Goldthwait¹⁵ (Figs. 5 and 6). VMO was advanced distally and laterally and fixed at this position using ethibond sutures (Fig. 7). Soft tissue balancing was checked with each step to fine-tune patellar tracking and knee range of movement (Fig. 8A and B). Closure of the wound was done in layers and a plaster of paris above knee slab was applied in extension. After suture removal at 2 weeks patients were subjected to gradual range of movement exercises of knee and progressive weight bearing.

2.2. Results

There were 4 females and 2 males. The age ranged from 5 to 13 years and the average age was 9.6 years. In four patients right knees were affected and in two patients left knees were involved. The average duration of surgery was 80 min and average hospital stay was 3 days. The average follow up was 12 months (range 7–24 months). There was no recurrence of patellar instability in any of the cases. The mean Kujala score before surgery was 48 which improved to 95 after the procedure (Table 1). There were no complications of patellar fracture or infection.

Fig. 1. Extensive release of vastus lateralis done from lateral intermuscular septum. Lateral retinaculum is detached from patella tendon.

Fig. 2. Lateral half of patella tendon is detached from tibial tuberosity. Hamstring tendon passed through transverse tunnel in patella. The lateral half of tendon passed over anterior patella and brought towards medial side.

3. Discussion

Habitual dislocation of patella is a rare condition which is different from recurrent patellar dislocation.¹ A more holistic approach is required for habitual patellar dislocation. The pathology consists of very tight lateral patella retinaculum, fascial

Fig. 3. The two ends of tendon are passed between vastus medialis and capsule and then brought out towards insertion of adductus magnus tendon.

Fig. 4. Tendon graft (dashed arrow) is passed below the tendon of adductor magnus (solid arrow) and folded over it. Graft is sutured to itself and the tendon of adductor magnus.

Fig. 5. Lateral half of patella tendon is brought to medial side by passing it under the medial half.

Fig. 6. Transposed lateral half of patella tendon is sutured to its medial half and periosteum and pes anserinus.

bands and vastus lateralis. The vastus medialis is deficient. There could be associated bony abnormalities such as hypoplasia of femoral trochlear groove, genu valgum, increased femoral anteversion and/or external tibia torsion and a high riding patella.¹¹ Lai et al. showed that vastus lateralis has fibrosis and muscle fibre degeneration on histopathology and MRI examination.¹⁶ Joo et al. described four in one procedure for habitual dislocation of patella in children. It consists of lateral release, proximal tube realignment of patella, semitendinosus tenodesis and transfer of patella tendon.¹¹ It is a combination of procedures which have been described by various authors as independent procedures for recurrent and/or habitual dislocation of patella. Niedzielski et al. showed good results using the same technique.¹⁷ We did an extensive lateral retinaculum release. It extended distally to the lateral border of patella tendon and proximally till the junction of middle and distal third of thigh. The vastus medialis muscle was separated from the quadriceps tendon by sharp dissection. It was

Table 1

Details of all the six patients describing age, sidedness, follow up and pre and postoperative Kujala score.

S. No.	Age (in years)	Sex	Side	Follow up (in months)	Kujala score	
					Pre operative	Post operative
1	13	F	R	7	43	93
2	11.5	F	R	8	48	92
3	9.3	M	L	10	52	98
4	5	F	R	11	49	96
5	10.3	M	R	12	46	95
6	8.5	F	L	24	50	96
Average	9.6			12	48	95

Fig. 7. Vastus medialis is brought distally and laterally over patella and quadriceps tendon and sutured in that position.

brought distally and laterally at the end of the procedure and fixed to the quadriceps tendon and anterior patella. The gap in the lateral retinaculum was left open. Semitendinosus tenodesis was originally described by Galeazzi, where the distal attachment of the tendon is left intact and an oblique tunnel is made in patella for the tendon.¹⁸ It prevents superolateral displacement of patella. However, in habitual dislocation only the lateral movement of patella needs to be prevented. Hence we opted for a method of MPFL reconstruction which prevents only the lateral dislocation of patella. Many techniques have been described in children which avoid the damage to the distal femur growth plate.^{2,12,19} We used a technique of MPFL reconstruction which was a modification of the technique described by Yercan et al.¹² We modified the procedure by using gracilis tendon instead of semitendinosus and we drilled a simple transverse tunnel instead of an oblique/L shaped tunnel in patella. This allowed a smaller tunnel in patella and decreased the risk of fracture of patella. Roux Goldthwait described distal realignment of extensor mechanism by medial shift of lateral half of patella tendon under the medial half of the patella tendon.¹⁵ We adjusted the tension in the transferred lateral half of the patella tendon to prevent dislocation and tilting of patella. It was fixed to the periosteum and pes anserinus with non absorbable sutures. Additional sutures were placed between the medial and lateral halves of the patella tendon.

Osteotomies of distal femur and patella have been described to treat the distal femur dysplasia.⁶ But we did not perform any osteotomy as it has been shown that the distal femur and patellofemoral joint remodel very well after soft tissue correction alone.^{11,16} The drawback of the study is that due to rarity of the condition only few cases were evaluated. More number of cases are required to statistically compare different methods of treatment of habitual patellar dislocation

A

B

Fig. 8. (A) Reduced patella in flexed knee position. (B) Reduced patella in knee extension.

Conclusion

We conclude that our method of treatment of habitual patellar dislocation in children with younger age with open physis reproduced excellent functional outcome. It is simple, cheap and does not require any image guidance.

Conflicts of interest

The authors have none to declare.

Authors contributions

RM contributed in conception and design of study, analysis and interpretation of data, performed surgical procedure in all patients, critically revised and drafted the manuscript. AS contributed in collection, analysis and interpretation of data, literature search and he critically revised and drafted the manuscript. VM contributed in literature search and drafting the manuscript. AR contributed in collection, analysis and interpretation of data, literature search and drafting the manuscript. NS contributed in collection, analysis and interpretation of data.

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