

Patellar band for patellofemoral disorders: results and indications

M. FUKUSHIMA*, Y. SIGENO*, K. YAMAMOTO*, T. NAKAMURA†, T. WATANABE†

*Department of Orthopaedic Surgery, National Kure Hospital, Hiroshima, Japan.

†Nakamura Brace Company, Shimane, Japan.

Abstract

In patellofemoral disorders, some cases respond well to conservative management thus the authors' initial treatment is conservative. The Patellar Band (PB) was reported previously (Nakamura *et al.*, 1987). Since then the indications for the band have been investigated. Sixty four patients treated by the PB without operative treatment were classified into eight groups. The Severity of Dysfunction (SOD) was assessed by three grades. The First Grade is dull pain after walking or running for a long distance, the Second Grade is sharp pain on climbing up and down stairs, the Third Grade is a feeling of insecurity. The grouping was as follows: Group Ia — plica syndrome with First Grade of SOD and Ib with Second Grade of SOD. Group IIa — chondromalacia with First Grade of SOD and IIb with Second Grade of SOD. Group III — maltracking patella with patellar pain on flexion. Group IVa — subluxation or dislocation of patella with no previous history of patellar symptom and IVb — recurrent dislocation. Group V — degenerative change of the patella. The PB has been proved to be most effective in Groups Ia, IIa and IVb although it is beneficial in half the cases in Groups IIb and III. The subluxation of the patella was partially reduced without recurrence of dislocation during sports activity and the feeling of insecurity was relieved by the PB. The overall results were not related to age

or activity level of the patient. The indication of the band for painful knees was not clearly determined in this study. In all operated cases, it was effective for postoperative instability after lateral release of the retinaculum.

Introduction

In patellofemoral disorders, two main problems are pain and instability of the knee. The origins of these disorders may be from the plica of the synovia, haemodynamic abnormality of the patellar spongiosa, subchondral bone in chondromalacia of the articular cartilage or subluxation or dislocation of the patella on extension of the knee which may be attributable to increased Q-angle and sulcus angle. The maltracking patella may be attributed mainly to contracted retinaculum and lateral tilt of the patella which cause pain on flexion due to excessive pressure on the lateral facet. The severity of dysfunction in this disorder should be determined before treatment. The authors developed the Patellar Band (PB) in co-operation with the Nakamura Brace Company (Nakamura *et al.*, 1987). Since then the PB has been used all over the world. In this paper, the results are reported of conservative treatment by this band and an attempt is made to determine the indications for its use.

Method

Patient group

Some 64 cases were available for a follow-up

All correspondence to be addressed to Dr. Mitoshi Fukushima, Dept. of Orthopaedic Surgery, National Kure Hospital, 3-1, Aoyama-cho, Kure-shi, Hiroshima-ken, 737 Japan.

Table 1. Age distribution.

Age	Numbers
10-19	13
20-29	6
30-39	3
40-49	7
50-59	18
60-69	17
Total	64

study over the past 8 years. Their age distribution is shown in Table 1.

Score scale

The scores were obtained by subtracting the total points allocated to each item from 50 before and after application (Table 2). The items consisted of pain, instability, severity of dysfunction and physical findings.

Severity of dysfunction (SOD)

It is important to determine by close interview with the patient which dysfunction is the main problem.

First Grade — dull pain appears after walking or running for a long distance which is ascribed from low grade pressure on the surface for a long period or/and repetitive stretching and oedema of the plica.

Second Grade — sharp pain appears on kneeling or going down the stairs which is due to high grade pressure on the articular surface

Table 2. Score scale.

Pain		
none		(0)
mild —	dull pain, after sports or work	(-5)
moderate —	constant pain on motion	(-10)
severe —	severe pain and limited range of motion	(-15)
Instability		
giving way or locking		(-5)
insecurity or fear of dislocation		(-15)
dislocation and history of dislocation		(-15)
Severity of dysfunction (SOD)		
First Grade —	pain occurs on a prolonged walking	(-2)
	a prolonged bent knee position	(-2)
Second Grade —	pain occurs on going down stairs	(-2)
	on squatting	(-2)
Third Grade —	instability occurs on running or jumping	(-2)
Physical findings		
synovitis		(-2)
apprehension sign		(-2)
facet tenderness (medial or lateral)		(-2)
plica sign		(-2)
quadriceps atrophy		(-2)

of chondromalacia patellae, occasionally being accompanied by synovitis or bursitis.

Third Grade — feelings of insecurity and pain which are due to subluxation and maltracking of the patella.

Classification of the cases

Group Ia (n=5) — Plica syndrome, First Grade of SOD

Ib (n=0) — Plica syndrome, Second Grade of SOD

In the arthrography, suprapatellar and mediopatellar plicas are demonstrated.

Group IIa (n=11) — Chondromalacia, First Grade of SOD

IIb (n=8) — Chondromalacia, Second Grade of SOD

Tenderness is elicited on the facets of patella, Retinacular contracture and arthroscopic findings are positive.

Group III (n=12) — Maltracking patella, tilting of the patella on skyline views.

Sponge sign is positive. SOD is Second or Third Grade.

Group IVa (n=0) — Traumatic dislocation.

IVb (n=1) — Recurrent dislocation, no definite trauma. Apprehension sign is strongly positive with some roentgenographic abnormalities.

Group V (n=27) — Osteoarthritis of the patella, early degenerative change without varus deformity.

Criteria of results

Excellent — the score at follow-up ranges from 46 to 50, no pain and normal activity including sports:

Good — the score ranges from 40-50. Occasional discomfort or mild pain. Pain much relieved and subsides by application of the band for a few days if it recurs:

Fair — the score ranges from 30-39. Slight relief of pain is obtained, although surgical treatment is required in some cases:

Poor — the score is less than 29. No relief of pain is obtained.

Table 3. Duration of application (n = 64).

RESULTS	AVERAGE (months)	S.D.
EXCELLENT	9.08	11.04
GOOD	7.33	11.07
FAIR	3.12	2.25
POOR	1.80	1.17

a few days~48 months
(Average 5.2 months, S.D. 6.52)

Degree of activity level

- First degree — housewife, deskworker, only enjoying sports:
Second degree — student, belonging to sports circle:
Third degree — outdoor worker, sportsman, obese patient.

Decision on prescription

The patients who have the First and Third Grades of SOD were asked to climb up and down the stairs at the clinic. If they felt comfortable and had some relief of pain with stability at that time, the PB was prescribed.

Instruction to patients

During the first week the PB should be applied for about 2 hours in the morning and 2 hours in the afternoon with a break between. Complications include redness of skin, dermatitis or sweating problems.

The following weeks it should be applied during the daytime or during activity of sports or working.

In periodic application for osteoarthritis it should be applied during the painful period. If the patient feels comfortable he may remove it after the pain subsides until there is recurrence of the pain.

Table 4. The overall results in each group.

GROUP	EXCELLENT	GOOD	FAIR	POOR
I A	4	0	1	0
II A	8	3	0	0
B	2	2	3	1
III	5	2	5	0
IV B	0	1	0	0
V	3	8	9	7
Total	22	16	18	8

Table 5. The results in each decade of age.

	Excellent	Good	Fair	Poor
10~19	5	3	2	0
20~29	3	1	2	0
30~39	2	0	0	1
40~49	2	3	2	0
50~59	5	4	5	4
60~69	2	4	3	3
Total	22	16	18	8

Contraindications

It should not be applied until synovitis of bursa or hydrops of the knee subsides. Occasionally pain around the knee may originate from the lumbosacral region in which case the PB is contraindicated.

Results

The duration of application ranged from a few days to 48 months, averaging 5.2 months. Table 3 lists the results against the average duration of application.

The average scores were 35/50 (before application/at follow-up) in Group I, 25.2 (range from 22 to 28)/47.2 (from 42 to 50) in Group IIa, 23.0 (from 21 to 26)/42.6 (from 24 to 50) in Group IIb, 22.8 (from 19 to 26)/43.0 (from 37 to 50) in Group III, 15 (from 14 to 16)/46 (from 42 to 50) in Group IVb.

Table 4 displays the results obtained in the different Groups.

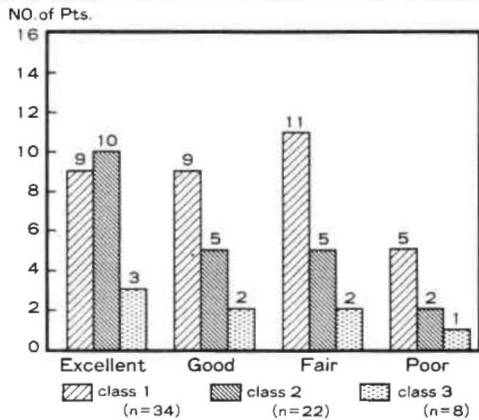
The best results were obtained in the age groups of less than 20 and more than 50 (Table 5).

In the First Grade of SOD, satisfactory results were gained in 15 out of 18 cases (83%), Fair to Poor accounted for 3 cases (17%) (Table 6). In the Second Grade, Excellent to Good constituted 14 out of 31 cases (45%). In Fair to Poor there were 17 cases (55%). In the Third Grade, Excellent to Good there were 9 out of

Table 6. The results in each grade of SOD.

	I	II	III
EXCELLENT	10	7	5
GOOD	5	7	4
FAIR	2	11	5
POOR	1	6	1
Total	18	31	15

Table 7. The results in each degree of activity level.



15 cases (60%), and in Fair to Poor 6 cases (40%).

Activity level was divided into three classes (Table 7). In Class I, Excellent to Good showed 53%, and Fair to Poor 47%. In Class 2, Excellent to Good represented 68% and Fair to Poor 32%. In the Class 3, Excellent to Good showed 63%, Fair to Poor 37%.

Discussion

The patients with recurrent subluxation of the patella have worn the patellar band initially

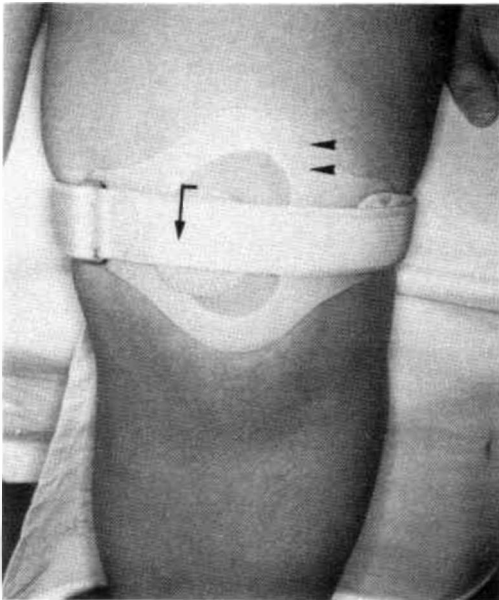


Fig. 1. The patellar band of modified type was applied to a 16 years old girl of Group IVa. This band consisting of semi-lunar cut-out of silicon and patellar pad relieved her feeling of instability since use of conventional type was not effective.

during the daytime for 2 to 4 years and then only during sports activities because insecurity of the patella almost subsides although apprehension signs remain. In Groups I, II and III, they wear the device only during sports activity. In Group V, the osteoarthritic patients wear the device during painful period, for example, they wear it for 5 to 7 days and may remain painless without application for the rest of the month.

The authors considered that in the most cases with suprapatellar plica as in Group Ia, complete relief of pain might be obtained, but in plica mediopatellaris, although some relief might be obtained surgical removal was eventually required in most cases. In the knees with pain and swelling, there was no effect obtained by the PB although it was effective after subsidence of synovitis. In Group III, it was very effective in those patients who complained of mild pain which subsided but most wished surgical treatment.

In Group V of more than 50 years old, the PB showed slight to moderate relief of pain in less active patients.

SOD should be decided by close interview with the patients, since the PB is most effective

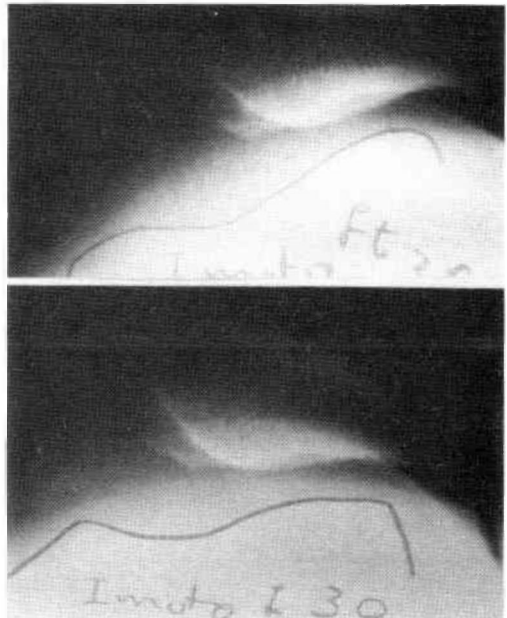


Fig. 2. 26 years old with recurrent dislocation of bilateral knees since 13 years old. (Above) The roentgenogram indicates skyline view in 30° of flexion without PB. (Below) Skyline view with PB.

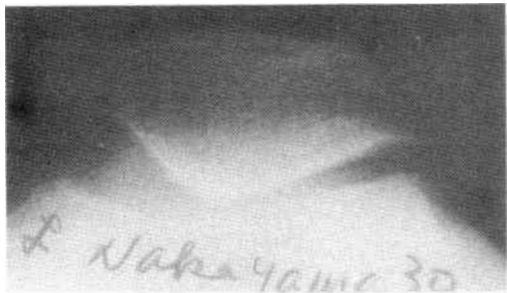


Fig. 3. 62 years old male in Group V. The skyline view revealed sclerotic bone change of the articular surface of patella. Pain was relieved by its application for a few days and subsided for the rest of the month without it.

in the First Grade. Dull pain or stiffness of the knee may occur from a repetitive low pressure burden on the cartilage for a long time. In this situation, the PB may relieve abnormal impact by realignment of the patellofemoral joint. In the Second Grade pain prevails over instability so its effect was almost 50%. Lateral release may relieve pain although instability increases to some extent postoperatively and the PB holds the patella in the groove so that patients notice improved stability of the knee on walking. After removal of suture, the PB has been worn in all patients who have received lateral release of the retinaculum. In the third grade of Group IV, anxiety of dislocation is relieved by wearing the PB although eventually most of them have been treated surgically except for two cases.

In regard to the degree of activity there is no definite interference by the patellar band. Some volley ball players or baseball players use the PB successfully during sports activity.

The band should be applied to those patients who have mild pain of First Grade of SOD and insecurity in patellofemoral disorders and minimal joint laxity due to cruciate ligamentous injury and impaired sensation around the knee. It is beneficial in relieving pain and gaining stability on walking and kneeling.

Summary

1. The PB was most effective in Groups Ia, IIa and IVb but in Groups IIb, III and IV only half of the cases were effective.
2. The subluxation of patella was partially reduced without subsequent dislocation on skyline view of 30° flexion.

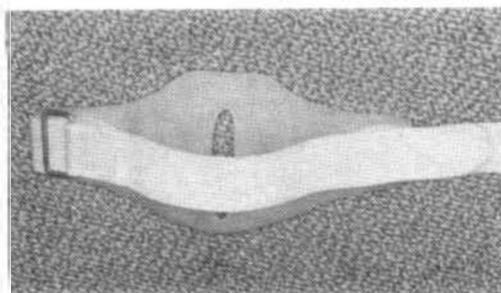


Fig. 4. 53 years old male with injury of lumbosacral plexus found possible to kneel easily by its application. (Above) Shaded area indicates impaired sensation. (Below) Special type of PB.

3. Its effectiveness was not related to age or activity of the patients.
4. Feeling of insecurity and giving way were relieved in most cases, but the indication of this band to painful knees was not clearly determined.
5. In all operated cases, it was effective for postoperative instability after lateral release of the retinaculum.

REFERENCES

- NAKAMURA T, FUKUSHIMA M, WATANABE T (1987). A new knee orthosis: clinical evaluation of a patellar band. *Orthot Prosthet* **40**(1), 20-26.