LATERAL SUBSTITUTION FOR CHRONIC ISOLATED ANTERIOR CRUCIATE LIGAMENT DEFICIENCY

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Thirty-five patients who had been surgically treated for major symptomatic isolated chronic anterior cruciate ligament deficiency by lateral extra-articular reconstruction alone were reviewed at an average of five years after operation. Seventy-seven per cent of patients reviewed were improved subjectively, and 83% of patients who were examined had objective evidence of only minor instability or none at follow-up.

However, only a few patients had “normal” knees and many continued to have minor symptoms of instability with some restriction of activity. Most of the unsatisfactory results were in patients with significant chondral pathology at the time of reconstruction. While an extra-articular pivot-shift repair did not correct all the symptoms and signs completely, most patients were improved subjectively and objectively, and there were few complications.

Lateral extra-articular surgical stabilisation procedures have been proposed as a possible solution to the problem of the anterior cruciate ligament (ACL) deficiency syndrome (Kostuik 1977; Kennedy, Stewart and Walker 1978; Losee, Johnson and Southwick 1978; Arnold et al. 1979; Ellison 1979; Fox et al. 1980; Ireland and Trickey 1980; Teitge et al. 1980; Clancy et al. 1982; Fleming, Blatz and McCarroll 1983).

MacIntosh and Galway reported the first of these reconstructions using a tethering strip of iliotibial band to “maintain the lateral tibial plateau under the femoral condyle in extension” in seven patients (Galway 1971, 1972; Galway, Beaupré and MacIntosh 1972). Kostuik (1977) reported on his experience with this repair in 72 patients and found that 79% had no subjective instability. MacIntosh and Darby (1976) reviewed 90 patients at six months to five years after operation and noted that their results were “most encouraging”, but did not elaborate. Ireland and Trickey (1980) used a slight modification of the MacIntosh substitution and found that 74% were “satisfactory”.

Collectively, these reviews suggest that MacIntosh substitutions may be capable of improving the chronic “anterior cruciate ligament syndrome”. However, since these substitutions were commonly combined with other repairs or reconstructions in those studies, often in knees which also had other ligamentous injuries (Johnson 1983), it is not clear if the MacIntosh procedure alone was the reason for improvement.

Our purpose in this paper was to evaluate the subjective and objective efficacy of an isolated modified MacIntosh extra-articular reconstruction for chronic isolated ACL deficiencies, at five-year follow-up.

METHODS

A retrospective 12-year review of case notes of the senior author (RWJ) showed that 135 patients had been treated with the modified MacIntosh procedure, hereafter called the pivot-shift operation, at a minimum of two years previously. The prerequisite for inclusion in the study was major giving way, with objectively evident gross lateral pivot-shift and arthroscopic evidence of isolated ACL insufficiency (Jackson 1984). Patients with documented evidence of combined ligament injuries, any other ligament repairs, or other anterior cruciate reconstructions before, or in combination with, the pivot-shift operation were eliminated; as were 40 patients with major meniscal pathology which could simulate cruciate deficiency.

The indication for surgery was one or more major episodes of giving way of the knee despite appropriate conservative measures (Noyes et al. 1983a,b). All patients had a grossly positive pivot-shift and were graded as follows: Grade 0 – normal knees; Grade I – minimal pivot-shift, "trace pivot"; Grade II – positive pivot-shift with definite subluxation and relocation; Grade III – gross pivot-shift with dramatic relocation.
Treatment was similar in each patient and the surgery was performed by one surgeon (RWJ). It consisted of passing a 1.5-cm wide distally based strip of iliotibial band under the proximal part of the lateral collateral ligament (LCL) and through an oblique tunnel in the tendinous lateral head of the gastrocnemius, distal to the insertion of the lateral intermuscular septum (Figs 1 and 2). With the tibia laterally rotated, the iliotibial graft was then put under tension while the pivot manoeuvre was tested to confirm that the pivot shift was eliminated. While this tension was maintained with the knee at 90° of flexion the graft was then sutured to both the proximal LCL and the gastrocnemius tunnel (Fig. 3). With the tibia remaining laterally rotated, the graft was then folded distally superficial to the LCL and sutured into position as a “return lateral loop”. The proximal iliotibial defect was closed with heavy interrupted sutures (Figs 4 to 6). Postoperatively the knee was immobilised in a long leg plaster with the knee flexed at 90° and the tibia and foot laterally rotated 20° to 30° for several weeks. It was then placed in a cast brace for four weeks and allowed 30° to 90° of movement. Active quadriceps and hamstring therapy followed, with graduated activity and protective bracing.

Review. The study population of 35 patients were sent a questionnaire and asked to report for examination by a single observer (CF). The knees were graded from 0 to 3 in terms of increasingly positive Lachman tests, anterior drawer laxity and lateral pivot-shift tests by all the methods in current use (Larson 1983), as well as grading the integrity of all the other major structures in the knee.

A grading system similar to those used by others (Loosee et al. 1978; Ellison 1979; Fox et al. 1980; Ireland and Trickey 1980), but with an emphasis on improvement rather than normality, was then used, as follows: Excellent – a normal, or a very nearly normal knee. Subjectively, “much better”, with the knee never a reason for modifying activity. Objectively, a negative lateral pivot-shift sign, or only a “trace pivot”. Good – subjectively much better than before operation with minimal restriction in activity. Objectively, a negative pivot-shit or only a “trace pivot”. Fair – significant giving way of the knee which is only slightly better than before treatment, with definite restriction of activity. Mild to moderate (Grades I to II) lateral pivot-shift sign. Poor – significantly disabled due to knee instability or arthritis. Unable to participate in sports.

RESULTS

Thirty-five knees (22 right and 13 left) in 35 patients (22 males and 13 females) were reviewed at an average of five years after operation (range 2 to 12.5 years). Eleven patients were interviewed only, while the remaining 24 were interviewed and examined; because of our emphasis on subjective improvement, all 35 patients were rated and are reported here.

The majority of injuries were from rugby and American football, with fewer attributed to basketball, soccer or skiing. The average age at injury was 22.8 years for males (range 17 to 35 years) and 20 years for females (range 15 to 29 years). The average duration of symptoms before operation was 4.3 years (range 3 months to 8 years).

Complications of the pivot-shift operation were infrequent and morbidity was low. The average time to return to sports was six months (range from three months to one year). There were no peroneal nerve problems and no infections. Three of the 24 patients examined (12%) had some loss of movement; two had failed to recover full extension (lacking 5°), and the third, clearly arthritic, lacked 10° of extension and 15° of flexion. The most common complication was an “inability to kneel due to tightness in the knee”, which had not been present before the operation.

At follow-up 27 of the 35 patients (77%) reported that the knee was “definitely better” than before the operation; six (17%) reported that it was “slightly better” and two (6%) that it was “no better”. Thirteen (37%) reported virtually never having any “giving way” of the knees since the operation; 14 (40%) reported minor instability (though much less than previously) and five (14%) both minor and occasional major giving way. The remaining three patients (9%) reported continued episodes of major giving way, similar to, or worse than before the operation.

Fifty per cent of the group complained of some pain in the knee; in the majority only minor aching particularly affected by the weather. Six patients (17%) had definite arthritic pain that was troublesome and required treatment. Three patients had new meniscal pathology (one lateral and two medial) which had been treated arthroscopically after the pivot-shift operation and three others had symptoms suggesting current meniscal injuries.

Twenty-nine of the 35 patients (83%), said that, for a combination of reasons, including ageing and changing lifestyles, they had modified their approach to activity since the injury. Many chose to avoid the sport at which they had been injured, but did not avoid other sports such as basketball, tennis and racketball. They had, therefore, “returned to sports” (Clancy et al. 1982) but with self-imposed modifications.

Objective examination revealed that gross pivot-shifts pre-operatively had almost certainly been decreased as a result of treatment. None of the 24 patients examined had a Grade III pivot-shift sign; four (17%) had a Grade II pivot shift, 15 (62%) had only a “trace pivot” (Clancy et al. 1982) and the remaining 5 (21%) had an absolutely negative pivot-shift. The anterior drawer sign was positive in 16 of the 24 patients examined. The Lachman test was positive in 19 patients: 10 had a
The operative procedure consists of isolating a distally based strip of iliotibial band and passing it beneath the proximal part of the lateral collateral ligament and through an artificially created posterolateral tunnel, through or under the lateral head of the gastrocnemius tendon. The strip is then folded distally and used as a patch for the distal iliotibial band defect.
Grade I Lachman with a firm end-point only slightly different from the normal knee, while nine had a more pronounced Grade II or Grade III anterior tibial translation with increasingly indefinite end-points. There was no varus instability in any patient at follow-up.

Overall, 13 knees (37%) were rated as excellent, 13 (37%) as good, 6 (17%) as fair and 3 (9%) as poor at a mean of five years after operation. If excellent and good results are grouped as being "satisfactory", roughly 75% of the results were satisfactory, and 25% were unsatisfactory. Similar percentages were obtained for the assessments based on the interview alone and for those who were also examined.

DISCUSSION

When comparing results with other retrospective clinical reviews of lateral substitutitons it is important to make certain that the criteria for success are at least similar. Although failures or relative failures are recorded by some with "any episodes of instability" (Clancy et al. 1982), "any subjective subluxations" (Losee et al. 1978), or "any persisting instability" (Ireland and Trickey 1980), others have included in their acceptable results patients with "occasional discomfort, swelling, or instability" (Ellison 1979), "fractional return of function and decreasing buckling" (Fox et al. 1980) and "some apprehension during sport" (Ireland and Trickey 1980).

In this present study we accepted slight disability, since the pre-operative ACL complaints were chronic and to expect normality therefore seems unreasonable. On the other hand it is clear that our results are less than ideal, since 83% of patients continued to have some symptoms after operation.

In terms of objective results, while absolutely negative pivot-shift signs are one criterion of success (Kennedy et al. 1978; Losee et al. 1978; Ireland and Trickey 1980; Clancy et al. 1982; Fleming et al. 1983), many investigators have graded "trace pivots" (Clancy et al. 1982), "Grade I pivots" (Fox et al. 1980; Lipscomb, Johnston and Snyder 1981), or "Grade I instability" (Ellison 1979) as satisfactory or acceptable. We have chosen the latter since the majority of our patients had only minor pivot instability and had clearly been improved by their treatment. On the other hand we recognise that some instability persists and that very few have been "normalised". Whether the failure of this extra-articular repair to restore absolute knee stability in the majority was due to ongoing tibial translation (most patients had positive drawer and Lachman tests), patient selection, suboptimal graft positioning (Krackow and Brooks 1983), technical failures at the time of surgery, gradual tissue failures over a period of time, or to the fact that most of these patients had lost other stabilisers or chondral surfaces, or had remodelled bony geometry, remains unknown.

Another important comparison of this procedure involves assessment of its complications and morbidity. Probably the greatest concern in ACL reconstruction has been the potential for causing new problems in the operated leg, such as late varus instability (Kennedy et al. 1978; Teitge et al. 1980; Fleming et al. 1983).

Apparently, the closure of the iliotibial band in the present procedure has prevented this problem without severely compromising the patellofemoral joint (Arnold et al. 1979). It is possible that the unusual "tight feeling" and inability to kneel comfortably is related to this closure, or to the patellofemoral joint, but this could not be proved by the methods used.

Finally, it appears that the pivot-shift operation causes less permanent joint stiffness (88% returned to normal) than some other ACL reconstructive procedures (Losee et al. 1978; Clancy et al. 1982). This is probably related to the relatively minor, purely extra-articular nature of this procedure, and the short period of immobilisation, as well as the fact that bone is not involved and that an arthroscopy is not performed. In contrast, the Losee procedure had a 64% incidence of flexion loss, probably due to a combination of these factors.

Our numbers were not large enough and our parameters were too mixed to establish whether or not the reconstructions deteriorate with time. The mean follow-up time in the excellent group was 4.8 years and that in the good group was 4.2 years. Follow-up of the fair and poor categories was 6.7 years, suggesting possible deterioration of the repair or perhaps simply that the natural history of ACL deficiency is not arrested by the surgery. At least one-third of patients reviewed had definite arthritic changes. It is not clear, of course, how many of these active people with multiple disorders would have had arthritis without treatment after the same period of time since the injury (Jackson 1984). Six patients have had meniscal lesions diagnosed or suspected since the operation. All but one of these were medial, suggesting that some sequelae of ACL injury are probably continuing, but that the lateral joint compartment may be relatively protected by the repair.

Twenty-one patients had chondral lesions at the time of operation. Virtually all of the unsatisfactory results (fair or poor) were in knees with serious chondral lesions, while those with good results generally had either mild or no chondral pathology; only three with excellent results had chondral pathology, two being very mild. This would appear to confirm the report by Kostuik (1977) that chondral lesions are a better predictor of eventual outcome than any other factor.

In summary, we note that the isolated pivot-shift operation along with the postoperative treatment described, has failed to return the majority of the chronic ACL-deficient knees to normality when judged either subjectively or objectively. It, therefore, cannot be advocated as a "complete cure" for chronic ACL.
instability and its sequelae. It does, however, offer low-risk long-lasting improvement to three out of every four patients with such deficiency.

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REFERENCES


