ORIGINAL ARTICLE

Arthroscopic Arthrofibrolysis of the Stiff Knee

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Abstract

In this study thirty three cases of stiff knee of various aetiologies were treated by arthroscopic arthrofibrolysis and their functional outcome analysed. This technique proved to be the best modality for treating stiff knee due to intraarticular adhesions.

Key words

Stiff knee, Arthrofibrolysis, Arthroscopy.

Introduction

The knee joint is the largest joint of the body, unique in its construction and complexities of its geometry. Free movement of the knee joint depends on the integrity of the various tissues surrounding it as well as the joint itself. The range of movement required for common activities are : 70° for level walking, 83° for climbing stairs, 93° for sitting and rising. Stiff knee is a debilitating problem for the patient and the commonest factor interfering with movement is adhesions, especially intra-articular which occurs within the synovial cavity, suprapatellar pouch, capsule, periarticular and articular tissue. Contracture of the capsule and shortening or adhesions of the quadriceps mechanism also lead to stiffness.

Intraarticular adhesions or arthrofibrosis is commonly seen after fractures of the long bones of the lower extremity, intraarticular fractures at the knee or acute ligamentous injuries, joint infections and finally surgical procedures that require arthrotomy. Predisposing factors include a history of intensive intraarticular procedures, sepsis, prolonged postoperative immobilization and poor rehabilitation. Disease processes such as tuberculosis and rheumatoid arthritis also result in adhesion formation and chondromalacia.

Treatment for this problem, traditionally has been closed manipulation and extensive surgery. Vigorous physical therapy and forceful manipulation under anaesthesia in an attempt to gain passive motion may result in patellofemoral compression, increased risks of chondral damage and fracture (1). The other option is quadricepsplasty as has been described by Thompson in 1944 and Nicoll in 1963 (2,3). The first modality proved to be less useful and both these procedures are extensive and carry considerable morbidity, and often require initial immobilization followed again by vigorous efforts at rehabilitation (4).

The considerations for open versus arthroscopic

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surgery include visualization and exposure, precision of technique, extent of pathology reconciliation, morbidity and expediency of treatment and recovery. Intraarticular visualization and reconciliation of pathology is best accomplished by an arthroscope (5).

Even though arthroscopy was contraindicated in partially or totally ankylosed knee, with the advent of effective methods of arthroscopic surgery, it became possible to lyse intraarticular adhesions under direct vision (6,7). The original use of the arthroscope appears to have involved lysing isolated adhesions or fibrous bands in various areas of the knee joint (8). Thus, operative arthroscopy as a treatment alternative for arthrofibrosis, a new concept, developed obviously as an extension from other arthroscopic techniques.

Material and Methods

This study of the therapeutic benefits of arthroscopic arthrofibrolysis of the stiff knee was conducted in the department of orthopaedics, Sir Ganga Ram Hospital, New Delhi. Only those patients satisfying the following criteria were selected : stiffness of more than six months duration, stiffness due to periarticular and intraarticular pathology with restricted patellar mobility, failure of adequate physiotherapeutic measures in achieving mobility, patients with absence of gross joint destruction on conventional radiography, absence of active infection in the joint, knee flexion less than 100°, all healed fractures in the extremity in ambulatory patients. Proper history of the patient was taken. General physical examination and examination of the involved knee joint was done. Routine preoperative investigations and x-ray of the knee joint were done.

After the patient was anaesthetised (regional or general) the tourniquet was applied. During the procedure, the tourniquet was inflated when oozing caused blurring of vision. The part was scrubbed and waterproof draping was done in a conventional manner. The knee was then examined under anaesthesia and the preoperative range of motion documented.

The arthroscopic equipments used were foreviewing 30° telescope, probe, biospy punch, 5mm basket forceps, grabber, hooked knife and power shaver. The arthroscopic sleeve with a blunt obturator was then placed through the midpatellar lateral portal. An attempt was made to move the sleeve and obturator across the suprapatellar pouch into the medial and lateral gutters, into both medial and lateral joint compartments and the intercondylar notch. Care was taken to be gentle and avoid damage to the joint surfaces. The obturator was then removed. Continuous irrigation of fluid was maintained through the scope. Superolateral portal was then made and a hooked knife was introduced through the portal. The resection of adhesions was begun just proximal to patella, gradually progressing into the suprapatellar pouch. The adhesions formed multiple loculi in the joint. As the adhesions were gradually resected, the size of the loculus increased with concomitant increase in distension with fluid. The resection of adhesions was then done from medial and lateral recesses.

Next, the cutting instruments were introduced through the anteromedial portal and adhesions from the medial compartment and from the intercondylar area were resected. The adhesions lying in the lateral compartment were dealt with next. The arthrosocpe was then introduced through the anteromedial portal and cutting instruments through the midpatellar lateral portal. All adhesions from the capsule attaching to the articular cartiage surfaces were excised. The knee was then flexed and the adhesions in the posteromedial or posterolateral compartments were excised. Diagnostic arthroscopy was done concomitantly while resecting adhesions.

The medial and lateral retinacular structures were always very tight and fibrotic. Therefore, arthroscopic retinacular release using a hooked knife was invariably done.

The instruments liberally used were power shaver, basket forceps and cutting knife. After resection of all adhesions, the instruments were removed from the joint and a gentle closed manipulation performed. Extraarticular adhesions in the anterior capsular and retinacular areas may also give way with this procedure. Documentation of the range of motion was done under anaesthesia after surgery as was done preoperatively. After surgery, the joint was lavaged thoroughly for approximately five minutes till the joint appeared clear of all debris.

Usually, the lateral portal were left open for drainage of haemarthrosis. Sterile absorbent dressing was applied to the knee in flexion and compression maintained with application of elastic crepe bandage.

Patients were kept in the hospital overnight. Immediate, postoperatively, intensive physical therapy programme was begun. Active knee flexion was started on the bedside and active assisted exercises to the limits of flexion instituted. Quadriceps strengthening and straight leg raising exercises were also taught. Knee flexion was implemented till the maximum of the patients' tolerance. Adequate postoperative analgesia was helpful in motivating the patient to continue with range of motion exercises. Weight bearing ambulation could be allowed on the day of surgery or as early as the patient tolerated. The patients were recalled after two days, two weeks and then after three months postoperatively documenting the range of flexion at each visit.

Results

Thirty three patients of stiff knee were treated from 1993 to 1998, of which following inferences could be drawn.

Age and sex distribution

The commonest age group was 20-29 years. Youngest patient was 6 year old the oldest was 65 years. The mean age was 34 years. Of the total number of cases, there were 24 (73%) males and 9 (27%) females.

Table 1 : Age and Sex distribution of cases

Age in years	No. of cases	Male	Female
0–9	1	0	1
10–19	5	3	2
20–29	13	10	3
30–39	6	4	2
40–49	4	4	0
50–59	3	2	1
60 & above	1	1	0
Total	**33**	**24**	**9**

Aetiological distribution

Many patients had more than one aetiological factors invloved in pathogenesis. The cases showed a predominance of postraumatic stiffness, the majority of whom had undergone a surgical procedure about the knee followed by those who had been treated by non-surgical methods of fractures about the knee. Two cases were of rheumatiod arthritis, two a sequel of osteoarthritis knee, two cases of stiffness with a total arthroplasty in situ and one case of tubercular adhesions.

Preoperative range of motion

Thirty patients had a range of flexion limited to less than 90° and three patients had a range of motion 90° preoperatively Pain was characteristically absent and there was no evidence of any active disease process.

Period of stiffness before arthroscopic arthrofibrolysis.

The mean period of stiffness before arthroscopic intervention was 13 months. The least duration was four months of postraumatic stiffness after open reduction

and intimal fixation of a fracture of the upper end of the right tibia. The longest duration was more than 48 months.

Documentation of postoperative range of motion

Eighty five percent of patients (i.e. 28 patients) had a range of flexion 90° and above postoperatively which we consider very satisfactory in the Indian context. In only one patient we failed to gain any improvement in the range of flexion. This 25 year old male patient presented with knee fixed in a neutral position of 0° of 2 years duration. He had undergone multiple surgical procedures after sustaining a compound fracture of both bones of right leg following a gun shot injury. During arthroscopy, in addition to extensive adhesions and articular cartilage destruction, a bony bridge formation was present in the intercondylar area.

Gain in motion in degrees

The majority of patients (70%) had a gain of motion of 46° to 90°.

Discussion

Arthroscopy has grown tremendously in the last two decades. With arthroscopy, orthopaedic surgreons have pioneered the development of minimally invasive operative procedures, a trend that is growing in the entire field of surgery (9).

The development of operative arthroscopy techniques and instrumentation allowed the knee surgeon to evaluate the problem directly and to approach it in a stepwise manner even for patients with total knee prosthesis in situ (10).

Conventionally arthroscopy, in partial or complete ankylosis of the knee joint, was considered an absolute contraindication (11,12). O'Connor in 1977 stated that "if knee movements were less than 50°, then arthroscopy would be difficult to perform" (13). Today, arthroscopy in a stiff knee is a relative contraindication (14).

When unusual motion restriction was recognised early in the postoperative course, vigorous physical therapy and occasional gentle manipulation of the knee under anaesthesia was advocated (15,16). But it was later realized that these modalities may cause excessive patellofemoral compression with the risk of chondral damage or fracture. Thompson in 1944, described an extensive open quadricepsplasty for this problem (2).

With the rise of arthroscopy as a therapeutic weapon and the advent of effective methods of arthroscopic surgery, it has become possible to lyse intraarticular adhesions under direct vision (7,17).

Free movement of the knee joint depends on the integrity of the various tissues surrounding it as well as the joint itself. A stiff knee is a debilitating problem for the patient especially in the eastern part of the world.

The process of arthrofibrosis is a progressive one, with proliferation of fibrous connective tissue within the knee joint itself. Ultimately there is quite severe degenerative arthritis that develops with articular cartilage necrosis.

In present study, 33 cases were operated for knee stiffness by arthroscopic arthrofibrolysis. The period of stiffness ranged from 2 months to 3 years and 5 months (mean : one year one month). Postraumatic-postsurgical knee stiffness was found to be the major aetiological factor followed by posttraumatic nonsurgical cases. Stiffness was the major complaint of the patients. Pain was characteristically absent in most of the cases and there was no evidence of any active disease.

Intraoperatively, disease adhesions were visualized in all three compartments of the knee i.e. the medial and lateral compartments and the patello femoral articulation. Fibrolysis was gradually performed excising the adhesions.

After surgery, those patients who had a final range of motion more than 90° were regarded as excellent. Sixty-four percent (21 patients) had excellent result. Twenty-seven percent (9 patients) had final range of 64° to 90°, a good result. Six percent (2 patients) had fair result with a range of less than 40°. Three percent (one patient) had poor result. We failed to gain any motion in this patient. Our results were better than that of Klein *et. al.,* who in a study on 58 patients, showed excellent results in 54.5%, good in 21.7% and fair and poor in 23.8% (18).

The maximum gain in motion was achieved in those patients whose stiffness was due to trauma and had been operated upon (33% gained a mean of 71°). Next to gain motion were the traumatic (intraarticular fractures and fractures about the knee) nonsurgical patients (48% gained a mean of 66°) who underwent conservative treatment. Nontraumatic surgical patients (18%) gained a mean of 58°. Nontraumatic nonsurgical patients (3%) gained 55° of motion. Cohen *et. al.,* in a series of 10 cases reported 84° improvement in knee motion after arthroscopic adhesiolysis which is better than that we achieved in our series (19). Sprague *et. al.,* reported a mean gain of motion of 34° after arthroscopic procedures, which is less than what we achieved in our series . They also found that arthroscopic method is more successful in increasing flexion than in increasing extension (20). Postoperatively, none of the patients had any siginificant complications. All patients were followed up for three months according to protocol. All patients were pleased with their results and had no pain except one patient who had undergone multiple surgeries before this procedure and we had failed to gain any range in motion.

It took the patients several weeks to achieve their ultimate range of motion after arthoscopic arthofibrolysis. It was observed that the range of motion achieved passively on the operating table, indicated the maximum range of motion that the patient was able to achieve postoperatively. Vaquero *et. al.,* in a study on 21 cases also observed that longer follow up showed no improvement in range of motion after 6 months (21). However, 5 patients achieved a range of motion 5° to 10° greater than that achieved during the surgery. Four patients had a range of motion slightly less than that achieved during surgery. Those patients who continued with a regular exercise programme, at the latest followup, have reported further improvement in range of motion and also increase in strength and endurance.

Arthroscopic arthrofibrolysis is at present practised widely by specialized surgeons. New surgical instruments that are being developed, such as laser surgery and electrosurgery, shall further improve the techniques in application of arthrosocpic arthrofibrolysis.

Summary and Conclusions

Thirty-three patients underwent arthroscopic arthrofibrolysis of the stiff knee with satisfactory results. In no case did we encounter any complications, the procedure was done with minimum morbidity and excellent patient compliance.

Furthermore, we believe that the patinets of knee stiffness, irrespective of aetiology, are willing to have surgery in an effort to regain motion, especially in consideration to their social needs. It is our firm conviction that for the patients selected in this study, arthrofibrolysis proved to be the best modality for treating stiff knee due to intrarticular adhesions.

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