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Efficacy of arthroscopic arthrofibrolysis for stiff knee

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Abstract

Treatment of stiff, arthrofibrotic knee is challenging for the orthopedic surgeon, physiotherapist and for the patient. Various treatment modalities exist from conservative physical therapy, manipulation under anesthesia to surgical management with variable outcome. Our study aims to analyze the outcome of such knees with arthroscopic arthrofibrolysis and also its co relation to etiology and interval between treatments. Our study is analysis of 22 case of stiff knee which were treated with arthroscopic arthrofibrolysis. Analysis was done by using modified Blauth and Jager scoring system. As per Modified Blauth and Jager Scoring, 14 cases (63.6%) had grade IV decrease in range of motion preoperatively, 8 cases (36.4%) had grade III (severe) and none were in grade II (moderate) or grade I (mild). Out of 14 patients who had preoperative Score of IV, 10 improved to Score III and 4 had score II postoperatively at 6 months, which was significant ($P < 0.001$). Similarly, all 8 patients who had preoperative score of III has significant improvement to score II postoperatively at 6 months ($P < 0.001$). All patients had a range of flexion limited to less than 70° preoperatively. The mean flexion was $34.77^{\circ} \pm 21.70^{\circ}$ preoperatively, improved to $86.36^{\circ} \pm 19.47^{\circ}$ post-operatively at 6 month. 15 out of 22 patients (68.18%) had a range of flexion 90° and above postoperatively at 6 months, with mean gain in flexion 51.591° ($P < 0.001$). In our experience arthroscopic treatment of fibroarthrosis in the knee joint is a successful procedure. The goal of arthroscopic fibroarthrolysis is primarily to provide functional range of motion. However, our experience showed that the function of the joint can be improved even in cases with complex pathologies and after a prolonged interval between treatments.

Keywords: arthrofibrolysis, stiff knee, arthroscopy

Introduction

The knee joint is the largest, probably the most complex joint in the human body. This complexity allows it six degrees of freedom of motion: three rotations, three translations and two displacements. These motions are limited by ligaments, capsule and to some degree intercondylar eminence of tibia [1].

The average genu recurvatum is 5° for males and 6° for females, and the average flexion is 140° for males and 143° for females [1]. Prior studies incorporating gait analysis have shown that 67° of knee flexion required in the swing phase of walking, 83° to ascend stairs, 90° to descend stairs, and 93° to rise from a standard chair. The loss of knee flexion is usually better tolerated than the loss of knee extension. Small discrepancies in extension can result in increased energy consumption during gait and cause undue strain on the quadriceps musculature and patellofemoral joint.

The etiology for the development of loss of knee motion is multifactorial. Mechanical causes include loss of articular congruency, interruption of the extensor or flexor mechanism, a meniscal tear or a loose body, a substantial effusion, a Cyclops lesion [2], and non-isometric placement of the graft during reconstruction of the anterior cruciate ligament. Any acute injury causing pain may limit active knee motion. Quadriceps inhibition often occur concomitantly [3]. In most patients, limitations of motion resolve as the pain and effusion dissipate. In the presence of various pain syndromes, such as complex regional pain syndrome, additional muscle inhibition can occur. This quadriceps inhibition may allow scar tissue to form while the knee is held in a flexed position. A knee effusion also limits knee motion by inhibiting the function of the quadriceps muscle [3]. Atrophy of the quadriceps muscle and flexion contracture usually results and complicates treatment. Joint immobilization can complicate all

of these factors. Disuse may induce abnormal cross-links between collagen fibers at abnormal locations ^[4], decreasing their extensibility and promoting intra-articular and extra articular scarring.

Arthrofibrosis begins when the traumatic stimulus of an injury and/or surgery, leads the knee to form extensive, internal scar tissue, followed by shrinkage and tightening of the knee's joint capsule. In general, the likelihood of developing arthrofibrosis increases with the severity of a knee joint injury, the extensiveness of related surgery, sepsis, the length of time that the knee is subsequently immobilized and poor rehabilitation.

O'Connor ^[5] contributed to our understanding of the pathologies involved in describing a possible extra capsular band, extending from the proximal pole of the patella to the anterior femur that is responsible for loss of flexion. Parisien ^[6] identified capsular releases, in addition to lysis of adhesions and manipulation, to increase motion. Paulos *et al.* ^[7] introduced the phrase "infrapatellar contracture syndrome" (IPCS), and defined this syndrome as entrapment of the patella in association with loss of extension and flexion.

Patellofemoral pain is often a prominent component of arthrofibrosis. Stiffness is usually the primary symptom and is often worse in the morning hours. Even when the patient does not have pain, loss of motion and quadriceps weakness can be substantial impediments to the performance of activities of daily living.

Clinical signs include an antalgic, flexed-knee gait is often seen ^[8], Increased warmth, atrophy of the quadriceps muscle may be severe, depending on the stage of the process, and is accompanied by loss of quadriceps strength. Active and passive knee flexion and extension are often restricted and medial-lateral and superior-inferior patellar glide is reduced. This restriction of passive motion often has a spring-like end point, reflecting the density and stiffness of the thickened, inflamed, or scarred perapatellar tissue.

A stiff, arthrofibrotic knee is a very difficult problem for the orthopedic surgeon, physiotherapist and patient itself to handle. It requires a specially planned, intensive protocol of surgical and post-operative management.

The traditional treatment approach for arthrofibrotic knee is "Manipulation under Anesthesia" or "M.U.A.". In case of severely frozen knees, extremely stressful manipulation forces may be required to break up the scar tissue and get the joint moving again. This poses a risk to a patient who has not been able to bear much weight on his leg for quite some time and increases the chance of femoral or tibial fracture occurring at the time of joint manipulation. When joint is manipulated it is less likely to rupture the adhesive band than avulse it from its attachment to the synovial membrane, capsule or cartilage. This creates large bleeding surface, which predispose to aggressive generalize capsular fibrosis that is extremely difficult to treat.

In 1974, the first use of arthroscopic management was initiated by Jackson for motion loss related to arthritis ^[3]. The first arthroscopic series included 24 patients who developed motion restriction after open operative procedures and was reported by Sprague and associates ^[9].

The current concept for treatment of arthrofibrosis is Arthroscopic Arthrofibrolysis by direct visualization of joint cavity and resection of as much restrictive internal scar tissue as possible. 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 adhesion under direct vision. Thus, operative arthroscopy as a treatment alternative for arthrofibrosis, a new

concept, developed obviously as an extension from other arthroscopic technique. Today, it is quite common to perform arthroscopic lysis of adhesions after failure of appropriate non-operative and rehabilitative management. If the motion gained by arthroscopic releases and manipulation is not adequate, appropriate open releases may then be performed.

Methods

The study was conducted in Department of Orthopedics in Sir Ganga Ram Hospital, New Delhi from May 2011 to May 2013. Previous study had found 70% of patient had gain in range of motion. We anticipate the same with the gain in motion of 50⁰ to 90⁰ for which we need total sample size of 20, the significant level of the test is targeted at alpha-0.05. We had 22 patients who treated by arthroscopic arthrofibrolysis, fulfilling the inclusion and exclusion criteria were enrolled.

Inclusion criteria

1. Stiffness due to periarticular and intraarticular pathology with restricted patellar mobility.
2. Prolonged immobilization of extremity following fracture shaft femur and/or fracture shaft tibia (upper 3rd).
3. Stiffness of more than 2 months duration following regular aggressive physical therapy.
4. Absence of active infection in joint.
5. Knee flexion < 90⁰ and Extension loss any degree.
6. Patient with Infra patellar contracture syndrome

Exclusion criteria

1. Diaphyseal fractures of the femur with adhesions of the quadriceps.
2. Active sepsis and scars or cutaneous necrosis.
3. Ankylosed Knee.

All patients were admitted prior to surgery and detailed history was taken that included, complaints regarding patella-femoral pain, stiffness and limitation of motion with duration and progress of symptoms, probable preceding etiology, duration of immobilization and physical therapy. Physical examination included description of loss of flexion and loss of extension, skin over knee joints, (e.g. previous surgical scar marks, color of skin), Range of Motion, tenderness, patellar mobility. Range of motion was graded according to modified Blauth and Jager score. Radiological examination included standard weight-bearing anteroposterior, merchant, long-leg alignment, and bilateral 30 degree lateral views to assess for patella baja. Routine pre-operative investigation, fitness and consent were taken. After spinal anesthesia, a pneumatic tourniquet was applied on the operative thigh, the extremity is prepared and draped in a standard fashion, and the leg is exsanguinated and the tourniquet inflated.

The excision of adhesive bands and scar tissue was performed in a systemic fashion starting in the suprapatellar pouch. In cases which the pouch was severely scarred, Capsular distension with a 60-mL syringe and an 18-gauge needle, was done to allow easier and safer insertion of the arthroscope and outflow portal. First the superomedial outflow portal was established usually with a sharp trocar. The scope was placed through the standard inferolateral portal and directed into the suprapatellar pouch. If the arthroscope could not be easily placed into the intercondylar notch and transitioned a traumatically into the suprapatellar pouch, the arthroscope was removed and placed in the suprapatellar pouch. The superolateral working portal was established and scar tissue in the suprapatellar pouch was

removed and patellar mobility was reconstituted. The arthroscope was then switched to the superolateral portal, working through the inferolateral portal to free up the lateral gutter. Inferomedial portal was then established under direct visualization with the use of a spinal needle. A shaver was placed into the inferomedial portal, remaining lateral gutter adhesion were cleared followed by debridement of the medial gutter. The arthroscope was switched back to the inferolateral portal, and debridement of the medial gutter and the intercondylar notch was completed. The infrapatellar fat pad was mobilized from the anterior tibia. This re-established the pretibial recess, thus decreasing patellofemoral joint contact pressures. The intercondylar notch was visualized from both the inferolateral and the inferomedial portals to make sure there is no more scar tissue tethering the patella. At this point, range of motion was evaluated and manipulation performed. If the motion was still not adequate, we established posteromedial and posterolateral portals. The posterior portals were established using an outside-in technique under direct visualization. Appropriate excision of scar tissue and removal of any loose bodies was performed, paying particular attention not to injure the posterior neurovascular structures. After this was accomplished, the knee motion is again assessed, and a repeat manipulation is performed if necessary.

Arthroscopy portals were closed with interrupted 2-0 Ethilon suture. A sterile dressing is applied and rehabilitation was started in recovery room while the patient's pain was still controlled. Physical therapy is initiated the same day of surgery, reinforcing the motion gain to the patient. Maintenance of knee extension using prone heel hangs and isometric quadriceps-strengthening exercises. Patellar mobilization and knee sags working on knee flexion were also stressed. Daily outpatient or home based physical therapy started when patients were discharged and continued for at least 8 to 10 weeks.

Results

Our study involved 22 patients with 18 male and 4 female. The mean age was 27.91 years. The youngest patient was 15 years of age and the oldest patient was 42 years. The mean period of stiffness before arthroscopic arthrofibrosis was 26.18 months (range 2-180 months). The median time was 1 year.

Many patient had more than one etiological factors involved in pathogenesis. The cases showed a predominance of posttraumatic stiffness, majority of who had undergone a surgical procedure about knee followed by those, who had been treated conservative with cast/brace immobilization. Closed fracture distal end femur and proximal tibia/ patella due to RTA was the most common etiology, with 50.0% of the patients (n = 11). Others were compound fracture around knee following RTA (18.2%, n = 4), ACL reconstruction (9.1%, n = 2) and Two case of Septic arthritis (9.1%) following intraarticular injection and Incision and drainage. In three cases (13.6%) patient had been managed conservatively with above knee POP cast/Brace.

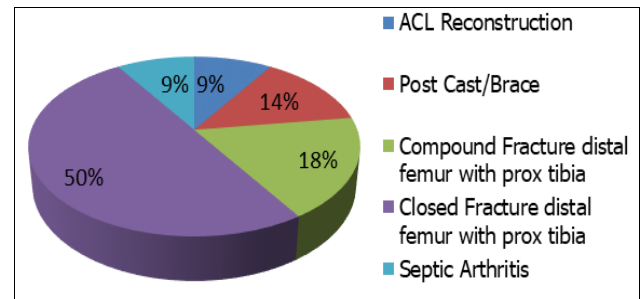


Fig 1: Etiology

As per Modified Blauth and Jager Scoring, 14 cases (63.6%) had grade IV decrease in range of motion preoperatively, 8 cases (36.4%) had grade III (severe) and none were in grade II (moderate) or grade I (mild). Out of 14 patients who had preoperative Score of IV, 10 improved to Score III and 4 had score II postoperatively at 6 months, which was significant ($P < 0.001$). Similarly, all 8 patients who had preoperative score of III has significant improvement to score II postoperatively at 6 months ($P < 0.001$).

All patients had a range of flexion limited to less than 70° preoperatively. The mean flexion was $34.77^{\circ} \pm 21.70^{\circ}$ preoperatively, improved to $86.36^{\circ} \pm 19.47^{\circ}$ post-operatively at 6 month. 15 out of 22 patients (68.18%) had a range of flexion 90° and above postoperatively at 6 months, with mean gain in flexion 51.591° ($P < 0.001$) which we consider very satisfactory in the Indian context.

Out of 22 patients, 6 patients (27.27%) had a combined loss of extension and flexion. 16 patients (72.72%) had loss of flexion with full extension. No patient had pure loss of extension. 6 patients had mean loss of extension $12.83^{\circ} \pm 7.98^{\circ}$ (range $3-20^{\circ}$) preoperatively. At 6 month post operatively, the extension improved to $10.50^{\circ} \pm 10.46^{\circ}$ (range $0-20^{\circ}$) with mean gain in extension 2.333° ($P = 1.00 > 0.001$), which was not significant.

11 patients who had closed fracture around knee and were treated primary with ORIF, had improvement in flexion from $27.72^{\circ} \pm 19.28^{\circ}$ preoperatively, to $90.45^{\circ} \pm 16.65^{\circ}$ post-operatively at 6 months with gain in flexion of $62.72^{\circ} \pm 25.33^{\circ}$. Four patients with compound fracture distal femur and/or proximal tibia, had gain in flexion $52.5^{\circ} \pm 21.01^{\circ}$ at 6 months post operatively. Three patients who were managed conservatively with above knee plaster cast/knee brace immobilization for 2-4 months had improvement in flexion from $50.0^{\circ} \pm 30.0^{\circ}$ preoperatively, to $110^{\circ} \pm 10.0^{\circ}$ postoperatively with gain in flexion $60.0^{\circ} \pm 40^{\circ}$. Two patients with septic arthritis following intraarticular injection followed by incision and drainage, had improvement in flexion from $15.0^{\circ} \pm 7.07^{\circ}$ preoperatively, to $57.5^{\circ} \pm 24.75^{\circ}$ postoperatively with gain in flexion $42.5^{\circ} \pm 31.82^{\circ}$. Two patients who had arthrofibrosis following Arthroscopic ACL reconstruction had improvement in flexion from $60.0^{\circ} \pm 0.0^{\circ}$ preoperatively, to $105.0^{\circ} \pm 7.07^{\circ}$ postoperatively with gain in flexion $45^{\circ} \pm 7.07^{\circ}$, while out of two only one patient had 4° improvement in extension, from preoperative 7° extension loss. Four patients who underwent revision arthrofibrosis had mean improvement in flexion from $37.5^{\circ} \pm 17.07^{\circ}$ preoperatively, to $96.25^{\circ} \pm 11.09^{\circ}$ postoperatively with gain in flexion $58.75^{\circ} \pm 15.47^{\circ}$. One patient with 20° extension loss had no improvement in extension, while other with 3° extension loss had improvement to 0° .

Table 1: Etiological outcome following Arthroscopic Arthrofibrolysis

Etiology	No of cases	Pre-operative	Post- Operative at 6 month	Gain in Flexion
Conservative with Cast/Brace	3	50.0 ⁰ ± 30.0 ⁰	110 ⁰ ± 10.0 ⁰	60.0 ⁰ ± 40 ⁰
Compound # distal femur + Proximal tibia	4	33.75 ⁰ ± 20.56 ⁰	86.25 ⁰ ± 12.5 ⁰	52.5 ⁰ ± 21.01 ⁰
Closed # distal femur + proximal tibia /Patella	11	27.72 ⁰ ± 19.28 ⁰	90.45 ⁰ ± 16.65 ⁰	62.72 ⁰ ± 25.33 ⁰
ACL reconstruction	2	60.0 ⁰ ± 0.0 ⁰	105.0 ⁰ ± 7.07 ⁰	45.0 ⁰ ± 7.07 ⁰
Septic arthritis	2	15.0 ⁰ ± 7.07 ⁰	57.5 ⁰ ± 24.75 ⁰	42.5 ⁰ ± 31.82 ⁰
Revision Arthrofibrosis	4	37.5 ⁰ ± 17.07 ⁰	96.25 ⁰ ± 11.09 ⁰	58.75 ⁰ ± 15.47 ⁰

Discussion

The term arthrofibrosis is often used to describe loss of flexion, loss of extension, or both. More precisely, it refers to a specific process in which scar tissue or fibrous adhesions form diffusely within a joint.¹⁰ Risk factors for developing arthrofibrosis of the knee include multi ligament injuries and knee dislocations, as well as prolonged immobilization, infection, and reflex sympathetic dystrophy^[11].

It is important to understand the myriad causes of motion loss so that treatment can be targeted at the specific cause. Causes of extension loss include notch impingement, ACL nodules, and posterior capsule pathology. Causes of flexion loss include suprapatellar adhesions, as well as medial and lateral gutter adhesions. Causes of both extension and flexion loss include improper graft position, infrapatellar contracture syndrome, soft tissue calcifications, global arthrofibrosis, reflex sympathetic dystrophy, and infection. As a general rule, causes of loss of extension reside in the intercondylar notch and posterior capsule, whereas causes of loss of flexion reside in the suprapatellar pouch and the medial and lateral gutters.

The arthroscopic treatment of knee arthrofibrosis has been reported as being effective in improving knee range of motion and restoring function with minimal complications. Among the first to report their results were Sprague *et al.*^[5, 9] who described a series of 24 patients with “fibroarthrosis” who gained an average of 45° of knee flexion with arthroscopic release of adhesions. Several authors have since reported similar results with knee range-of-motion improvements ranging from 45° to 68°.

The methods of treatment vary from conservative treatment linked with physiotherapy to mobilization under anesthesia and operative treatment by either arthrotomy or arthroscopy. The increase in effectiveness of endoscopic arthrolysis over the past years and increasing experience of surgeons with these methods have led to an extension in the indication for operative treatment of posttraumatic joint stiffness. Increasing numbers of patients benefit from this development today. Arthroscopic management of joint stiffness can render arthrotomy obsolete because of its negative side effects.

Sprague *et al.*^[5, 9] studied a series of 24 patients with “fibroarthrosis” with average follow up of 8 months after arthroscopic release of adhesions. The results were average gain in Flexion 36⁰ and average gain in Extension was 4⁰.

Vaquero, Vidal and Medina^[12] studied 21 cases of arthroscopic lysis as an alternative to mobilization under anesthesia. The results obtained are satisfactory with an average increase in the Range of Motion of 68⁰ with average gain in Flexion 59⁰ at final follow up and gain in Extension 9.1⁰. He also noted that the average gain in mobility at 6 months is significantly greater than that achieved in the immediate postoperative period and longer follow-up showed no improvement in range of motion after 6 months.

Christel *et al.*^[13] studied a series of 24 patients with arthrofibrosis of knee with average 13 months of follow up in 1986, got average gain in flexion of 67⁰ from preoperatively 57

to at final follow up 121⁰, and gain in Extension of 6⁰ from preoperatively 10⁰ to at final follow up 4⁰.

In our study, extension was not improved significantly compared to studies by Christel *et al.* and Vaquero, Vidal and Medina, but there is significant improvement in flexion as seen in previous studies. The results can be compared with studies with shorter terms between previous surgery and fibroarthrolysis^[11]. The activity level, compared with the preoperative situation, is improved in most cases. Our experience in this study showed that arthroscopic arthrolysis is an effective method for handling stiffness of the knee joint. It has a low rate of morbidity and a high degree of patient satisfaction. Arthroscopic treatment is generally most effective when the underlying pathology is predominately intraarticular. When the etiology of the motion loss is multifactorial or involves extra-articular structures, often a combined approach involving both arthroscopic and open techniques is indicated.⁶ Results from this type of treatment are generally less satisfactory than with those reported from solely an arthroscopic approach, mainly because the underlying causes for motion loss are more extensive.

Conclusion

The practical classification system that has been presented provides guidelines for the successful treatment of most cases of arthrofibrosis of the knee. The treatment of arthrofibrosis of the knee should be individualized, depending on the type of arthrofibrosis. Patients with all four types of arthrofibrosis had improvement in the range of motion after arthroscopic scar resection. All patients showed improvement in their mean stiffness. Prevention is still the best form of treatment for arthrofibrosis of the knee. Our results showed that arthroscopic management could be more beneficial for patients suffering from arthrofibrosis due to intraarticular adhesion with intact joint surface.

References

1. DeHaven KE, Cosgarea AJ, Sebastianelli WJ. Arthrofibrosis of the knee following ligament surgery, Instr Course Lect 2003;52:369-381.
2. Marzo JM, Bowen MK, Warren RF *et al.* Intraarticular fibrous nodule as a cause of loss of extension following anterior cruciate ligament reconstruction. *Arthroscopy* 1992;8:10-18
3. Jackson RW. The role of arthroscopy in the management of the arthritic knee. *Clin Orthop* 1974;101:28-35.
4. Millett PJ, Williams RJ III, Wickiewicz TL. Open debridement and soft tissue release as a salvage procedure for the severely arthrofibrotic knee. *Am J Sports Med* 1999;27:552-561.
5. Sprague NF, O'Connor RL, Fox JM. Arthroscopic treatment of postoperative knee arthrofibrosis, *Clin Orthop* 1982;166:165-72.
6. Parisien JS, The role of arthroscopy in the treatment of postoperative fibroarthrosis of the knee joint. *Clin Orthop* 1988;229:185-192.

7. Paulos LE, Wnorowski DC, Greenwald AE. Infrapatellar contracture syndrome. Diagnosis, treatment, and long-term follow up. *American J Sports Med* 1994;22:440-449.
8. Thompson TC. Quadricepsplasty to improve knee function, *J Bone Joint Surg* 1944;26:36&79.
9. Sprague NF. Motion-limiting arthrofibrosis of the knee; The role of arthroscopic management. *Clin Sports Med* 1987;6:537-49.
10. Creighton RA, Bach BR. Arthrofibrosis: Evaluation, Prevention, and Treatment. *Techniques in Knee Surgery* 2005;4(3):163-172.
11. Shelbourne KD, Johnson GE. The outpatient surgical management of arthrofibrosis after anterior cruciate ligament surgery. *American J Sports Med* 1994;22:192-197.
12. Vaquero, Vidal, Medina. Arthroscopic Lysis in Knee Arthrofibrosis. *Arthroscopy* 1993;9(6):691-694.
13. Christel P. Herman S. Benoit S. Bornet D. Witvoët J. A comparison of arthroscopic arthrolysis and manipulation of the knee under anesthesia in the treatment of post-operative stiffness of the knee. *French J Orthop. Surg* 1988;2:348-355.