

RESULTS OF ARTHROSCOPIC ABRASION ARTHROPLASTY IN OSTEOARTHRITIS OF THE KNEE JOINT

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ABSTRACT

This paper is a retrospective review of arthroscopic abrasion arthroplasty plus debridement. This procedure was performed on 52 knees in 44 patients during the period January 1985 to June 1987 in the Singapore General Hospital. Follow-up period ranged from 3 to 27 months. All patients had moderate to severe degenerative osteoarthritis of the knees. Overall results were: 51% - improved; 23% - no change; 26% - worse. The results were better in the older age group and in those without significant deformity. There was improvement in 74% of the patients with normal alignment. Results were compared with those in world literature. Although results are encouraging, further research is required to reduce the proportion of patients with unsatisfactory results.

Keywords: Arthroscopy, abrasion arthroplasty, osteoarthritis knee

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INTRODUCTION

Recent advances in arthroscopic techniques and instrumentation have allowed many procedures performed through standard arthrotomy incisions to be done under arthroscopic visualisation.

In the degenerative or osteoarthritic knee, a wide variety of pathological changes in varying frequency and severity are seen:

- synovitis
- osteophyte formation
- articular surface degeneration
- loose bodies
- degenerative tears of the menisci
- tight lateral retinacula

Many of these problems are amenable to percutaneous arthroscopic debridement. The development of the motorised abrader in the early 1980s by Johnson provided impetus for abrasion arthroplasty of the exposed subchondral bone^(1,2). This allows access to vascular ingrowth which is an important prerequisite to any reparative process^(3,4).

Most patients with osteoarthritic knees can be successfully managed by conservative treatment programmes, while others require proximal tibial osteotomy or total knee replacement. Magnuson and Haggart^(5,6) both described methods of wide joint exposure, shaving of fibrillated cartilage, patellectomy (if required), trimming of osteophytes, removal of torn menisci and loose bodies. Pridie^(7,8) used less extensive procedures and

introduced drilling of bare subchondral bone to stimulate fibrocartilaginous repair.

As total knee replacement and osteotomy became established, open debridement was rarely performed. Arthroscopic debridement now allows a similar procedure to be done through small stab incisions over the knee. The role of this procedure is in its infancy and is as yet not clearly defined.

This paper is a retrospective review of arthroscopically abraded knees with degenerative joint disease. We have reviewed the overall results and attempted to identify patient subpopulations likely to benefit from this procedure.

MATERIALS AND METHODS

During the period January 1985 to June 1987, abrasion arthroplasty was performed on 52 knees in 44 patients. All patients were pre- and post-operatively diagnosed clinically and radiographically to have moderate to severe degenerative osteoarthritis of the knees.

Of the 44 patients, there were 31 females and 13 males ranging in age from 35 to 69 years (mean age group 56 years). All patients had initially gone through a period of conservative treatment programme consisting of one or several anti-inflammatory medications and physical therapy to the knee. Pre-operative range of motion averaged 120 degrees (range of motion = 30 to 150 degrees), except in one case (range of motion was only 30 degrees) who had osteotomy of both knees done previously.

Pre-operative symptoms

The commonest symptom was pain and swelling of the affected knee (77%). One third of patients had symptoms only after trauma. Instability and locking were less common. Fig 1 shows the distribution of knee symptoms.

OPERATIVE PROCEDURE

All operations were performed under regional or general anaesthesia. A tourniquet was applied. A 4.5 mm, 30 degree arthroscope with television monitoring was used. Motorised shaving and abrading instruments were used. Additional debridement procedures including meniscectomy, synovectomy and removal of loose bodies were performed. Less severe articular degeneration was shaved. Following arthroscopy, the joint was thoroughly irrigated and the incision closed. A bulky compression bandage was applied until discharge. Patients were allowed

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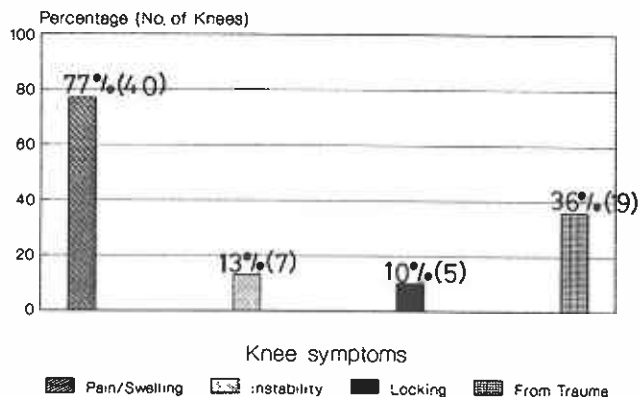
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immediate weight-bearing and active range of motion was encouraged.

Fig 1.
Distribution of Knee Symptoms (N = 52)



RESULTS

Patients were followed up for periods ranging from three to twenty-seven months. The evaluation was conducted both objectively and subjectively.

Patients were questioned on whether pain had become better, was the same or became worse. Range of motion was also tested to see whether it had improved. A scoring system was developed based on these two factors:

Pain:	Improved	2
	Same	1
	Worse	0
Range of Motion: (ROM)	Improved	2
	Same	1
	Worse	0

The scores were added to obtain the final outcome (Table I). Using this criteria, the overall results are shown in Table II.

Table I

Overall response to procedure, as assessed by pain relief and improvement in range of movement

NETT RESULTS POST-OP (pain relief/ROM)	SCORE
Improved	3 - 4
Unchanged	2
Worse	0 - 1

Table II

Distribution of overall post-op response to procedure (N = 52)

RESULT	% (No. of Knees)
Improved	51% (25)
Unchanged	23% (12)
Worse	26% (15)

Good to fair results are obtained in 74% of the cases. More than one quarter of patients had a poor result. All the patients with good to fair results continued to have subjective improvement of pain through serial follow-ups. The longest period of follow-up was 27 months.

Operative findings during arthroscopy were also tabulated and analysed (Table III).

The majority of patients had tricompartmental involvement. Articular surface degeneration and synovial hypertrophy was the 'sine qua non' of osteoarthritis. The medial was more commonly affected than the lateral meniscus.

Table III

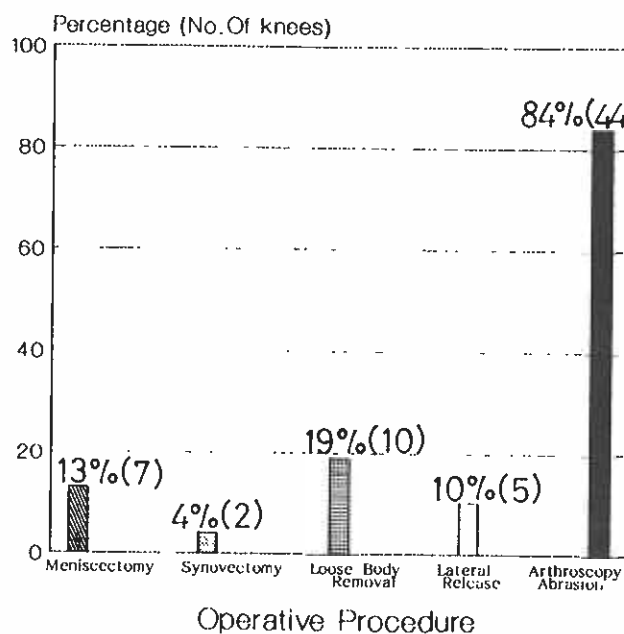
Operative findings during knee arthroscopy (N = 52)

NON-MENISCEAL	% (No. of Knees)
Articular surface degeneration	96% (50)
Synovial hypertrophy	44% (23)
Loose bodies	29% (15)
Adhesions	10% (5)
Chondromalacia	10% (5)
Torn/degenerate cruciate	6% (3)
Tight lateral menisci	4% (2)
MENISCEAL	% (No. of Knees)
Medial	19% (10)
Bilateral	13% (7)
Lateral	10% (5)

The main procedures performed are listed in Fig 2.

Meniscectomy was not performed in all cases of degenerative tears as some of them were treated with trimming or were left alone. Arthroscopic abrasion was the most common procedure performed.

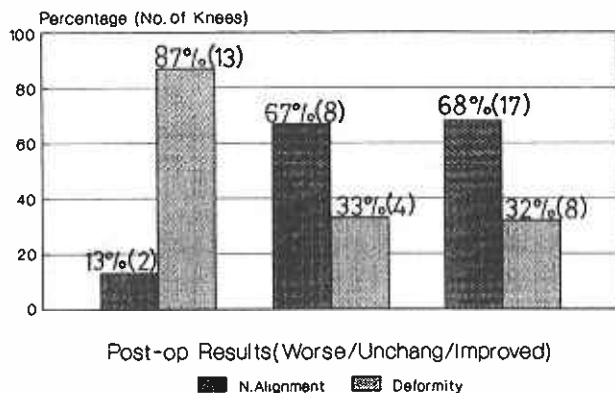
Fig. 2 – Distribution of Operative Procedures (N = 52)



Results were also correlated with the presence of any varus or severe valgus deformities (> 10 degrees) (Fig 3).

In 'knees' with worse results, 87% had deformity of the knees compared with 13% who had normal alignment. Patients with normal alignment responded better to this procedure (74% with normal alignment versus 28% with deformities improved).

Fig 3. – Varus/Valgus Deformity and Post-Operative Results (N = 52)



Patients whose knee symptoms worsened were analysed in an attempt to determine if the outcome could be predicted. There were 15 patients with such results - 13 females and 2 males. The mean age group was younger - 58 years (age range between 40 to 71 years old). There was no overall difference between this group and the overall study group in frequency of severe articular degeneration, loose bodies, torn/degenerate cruciate ligament, meniscal tears, adhesions or tight lateral retinacula.

On subsequent follow-up of these 15 knees, 6 eventually had high tibial osteotomy done. One had repeat arthroscopy and another an arthrotomy for septic arthritis. One developed subluxation of the patella for which tibial tubercle reattachment was done two weeks later. Presently, six are still on follow-up.

COMPLICATIONS

Two major complications resulted. One patient developed beta-haemolytic streptococcus septic arthritis. Arthrotomy and drainage of the joint was done. The patient recovered but with grossly diminished range of motion.

Another patient had subluxation of the patella after surgery. Tibial tubercle reattachment was done two weeks later. She did well on follow-up.

Immediate postoperative weight-bearing was encouraged, which also reduced the length of hospital stay.

The main paper published in world literature for the results of arthroscopic debridement/arthroplasty are tabulated in Table IV.

DISCUSSION

Burman et al, in 1934⁽⁹⁾, found to his surprise that a group of arthritic knees improved following arthroscopy.

Magnuson⁽⁵⁾ and Haggart⁽⁶⁾ popularised open debridement of the arthritic knee. This involved shaving of degenerated cartilage, excision of torn menisci, removal of loose bodies and osteophytes with or without patellectomy or patellar trimming. Magnuson in his series, had 60 out of 62 procedures with complete recovery. Haggart reported a similar series in which 20 patients improved with debridement.

Pridie⁽⁸⁾ introduced open drilling of the subchondral bone to stimulate cartilage repair. Insall⁽⁷⁾, reported on Pridie's work in 1974. With a 6.5 year follow-up by physician's assessment, 40 out of 62 knees had a good result, and by patient's assessment, 46 out of 60 thought the operation was a success. The results were better in the older age group.

Richards and Lonergan⁽¹⁰⁾ performed drilling of subchondral bone via the arthroscope. They reported 80% success at 25 months follow-up in 22 patients. Results were in symptomatic improvement only and were recorded retrospectively.

Table IV
List of main papers on arthroscopic debridement/arthroplasty

AUTHOR(S)	RESULTS
Richards and Lonergan, 1984 ⁽¹⁰⁾ – arthroscopic drilling	80% success in 22 patients
Spague, 1981 ⁽¹¹⁾ – arthroscopic debridement	75% good & 10% fair results in 63 patients
Salisbury et al, 1985 ⁽¹²⁾ – arthroscopic debridement	56% of those with alignment had pain relief
Johnson et al, 1986 ⁽²⁾ – abrasion arthroplasty	74 out of 95 patients were better subjectively
Bent and Masahke, 1989 ⁽¹³⁾ – arthroscopic debridement: – abrasion arthroplasty:	79% good to fair results (N = 67) 77% good results (N = 59)
Friedman et al, 1984 ⁽¹⁴⁾ – abrasion arthroplasty	Out of 73 patients, 66% improved 34% no change 6% worse

Arthroscopic debridement/abrasion arthroplasty has numerous advantages over an open debridement. It eliminates a long incision, reducing pain. Anaesthesia time is also reduced.

Johnson⁽²⁾ developed the technique of arthroscopic abrasion arthroplasty with the arthrotome to simulate Pridie's open drilling. He recommended two months of non-weight bearing following the procedure. This has been found to be unnecessary and reduces stimulation of articular cartilage repair.

In our study, 51% (25) of the 52 knees that underwent this particular surgical procedure had 'improved' symptoms in terms of pain relief and improvement in the range of movement of the involved knee. 23% or 12 knees were 'unchanged', while 26% or 15 knees 'worsened' in these symptoms.

Patients with symptoms and signs related to angular deformity fared poorly. Of 29 knees with varus or valgus deformity of more than 10 degrees, only 27.5% or about 28% had good results.

Of 23 knees with normal alignment, 17 knees or 74% had good results (see Fig 3). In the 29 knees with varus or valgus deformities, 13 knees or 45% worsened in symptoms post-operatively. Salisbury et al⁽¹²⁾, performed arthroscopic debridement on a group of 41 patients with 48 affected knees, with an average follow-up period of 27.8 months. Of patients with varus deformity of zero degrees or greater, 68% had poor results.

The duration of improvement from this procedure is not known. It probably varies with the individual patient. In this study, all patients with 'improved' or 'unchanged' results continued to have subjective improvement of pain. The longest duration of follow-up was 27 months.

However, in most studies, there remains a proportion of patients with poor results. Younger patients (probably due to higher mobility) and patients with significant deformity fared

poorly. The relief afforded by simple repeated flushing of the knee using a large bore needle as reported by Watanabe, Jackson, McCarthy, Dandy and others⁽¹⁵⁾, has been suggested as a lesser procedure to reduce poor results.

Removal of articular debris and/or prostaglandin removal is believed to afford at least temporary pain relief⁽¹⁵⁾.

The main advantage of arthroscopy over arthroplasty and osteotomy is commonly described as "no harm was done". But to avoid poorer results, careful patient selection, activity level and length of improvement need to be studied. The crux of the issue seems to be whether a fair result from a relatively less invasive operation is preferred to a good result from a more invasive and major operation.

The combination of arthroscopic surgery and high tibial osteotomy may be an attractive alternative to knee replacement in the younger patient if conservative treatment fails.

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REFERENCES

1. Jackson RW: The role of arthroscopy in the management of the arthritic knee. *Clin Orthop* 1974;101:28-35.
2. Johnson LL: Arthroscopic abrasion arthroplasty - Historical and pathological perspective: Present status. *Arthroscopy* 1986;2:54-69.
3. DePalme AF, McKeever CD, Sublin DK: Process of repair of articular cartilage demonstrated by histology and autoradiography with tritiated thymidine. *Clin Orthop* 1966;48:229-42.
4. Mankin HJ: The response of articular cartilage to mechanical injury. *J Bone Joint Surg* 1982;64A:460-2.
5. Magnuson PB: Joint debridement, a surgical treatment of degenerative arthritis. *Surg Gynaecol Obstet* 1941;73:1-9.
6. Haggart GE: The surgical treatment of degenerative arthritis of the knee joint. *J Bone Joint Surg* 1940;22:717-29.
7. Insall IN: Intra-articular surgery for degenerative arthritis of the knee - A report of the work of the late KH Pridie. *J Bone Joint Surg* 1967;48:211-8.
8. Pridie KH: A method of resurfacing osteoarthritic knee joints. Paper presented at the British Orthopaedic Association Spring Meeting 1959 (30th April - 2nd May). *J Bone Joint Surg* 1959; 41B:616-20.
9. Burman MS, Finklestein H, Mayer L: Arthroscopy of the knee joint. *J Bone Joint Surg* 1934;16:255-68.
10. Richards RW Jr, Lonergan RP: Arthroscopic surgery for relief of pain in the osteoarthritic knee. *Clin Orthop* 1984;7:1705-7.
11. Spague WF III: Arthroscopic debridement for degenerative joint disease. *Clin Orthop* 1984;7:1705-7.
12. Salisbury RB, Nottage NM, Gardener V: The effect of alignment on results in arthroscopic debridement of the degenerative knee. *Clin Orthop* 1985;198:268-72.
13. Bert JM, Mesahke K: The arthroscopic treatment of unicompartmental osteoarthritis: A Five-year followup study of abrasion arthroplasty plus arthroscopic debridement and arthroscopic debridement alone. *Arthroscopy* 1989;5:25-32.
14. Friedman MJ, Berasi CC, et al: Preliminary results with abrasion arthroplasty in the osteoarthritic knee. *Clin Orthop* 1984;182:200-5.
15. Burkes RT: Arthroscopy and degenerative arthritis of the knee -- A Review of the Literature. *J Arthroscopy Related Surg* 1989 6(1): 43-7.