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ORIGINAL STUDY

Arthroscopic debridement of the osteoarthritic knee under local anaesthesia

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This prospective study compared the efficacy of arthroscopic débridement in osteoarthritic knees under local, general or peridural anaesthesia. Between 1997 and 2001, 201 arthroscopic débridements were performed in 197 patients (173 partial meniscectomies, 192 articular trimmings, 119 microfractures, 201 lavage procedures) in 197 patients. Patients were treated under local (Group "L", n = 67), general (Group "G", n = 65) or peridural anesthesia (Group "P", n = 65). No tourniquet was used. The follow-up ranged from 24 to 72 months (mean : 32 months). No major complication was noted. Results were assessed according to the scale of Baumgaertner *et al* independently from the type of anaesthesia used (p = 0.71). Results were excellent in 85 cases (L : 30, G : 27, E : 28), good in 75 (L : 25, G : 24, E : 26), fair in 27 (L : 9, G : 8, E : 10), poor in 14 (L : 7, G : 4, E : 3). Arthroscopic debridement of the osteoarthritic knee under local anaesthesia appears as an efficient, simple, safe, painless and cost-effective method of treatment.

INTRODUCTION

Open articular debridement was a popular procedure in the treatment of the osteoarthritic knee, before the introduction and subsequent widespread use of high tibial osteotomy, total knee arthroplasty and arthroscopy *(10,17)*. Pridie *(22)* introduced drilling of the subchondral bone to enhance fibrocartilaginous repair in a less extensive surgical procedure .

Arthroscopic debridement represents one further treatment option in patients who suffer from degenerative arthritis of the knee. Debridement may involve several surgical steps. Lavage removes chondrolytic enzymes, debris and loose bodies causing persistent synovitis *(2,16)*. Meniscectomy, local synovectomy, articular trimming, removal of osteophytes and loose bodies, subchondral drillings and more recently microfractures are further steps

Local anaesthesia in diagnostic knee arthroscopy was first reported in the late 1970's *(19)*. The application of local anaesthesia technique in knee arthroscopy has been associated with a decreased incidence of complications. Furthermore it is considered a cost-effective procedure, with shorter hospital stay and a high degree of patient satisfaction. Unfortunately patient selection has some limitations *(9,14,15,18)*. There are several reports on arthroscopic knee surgery under local anaesthesia *(7,9,18,25)*, but to the best of our knowledge there is none on local anaesthesia in arthroscopic debridement.

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Table I. – Patients' data

Parameter		Group "Local" Patients : 67 Knees : 71	Group "General" Patients : 65 Knees : 65	Group "Peridural" Patients : 65 Knees : 65
Age (years)		60.8 (31-71)	59.9 (30-67)	62.2 (35-75)
Sex	Male Female	34 33	33 32	32 33
Knee	Right Left	35 36	33 32	34 31
Osteoarthritis type	Primary Secondary	63 4	60 5	63 2
Mean hospital stay in days		1.2 (1-3)	3.2 (3-5)	2.3 (2-4)
Follow-up duration in months		24-72 (30.9)	31.8 (24-70)	33.3 (24-62)
Mean follow-up duration in months		32 (24-72)		

MATERIAL AND METHODS

Two hundred and one arthroscopic debridements were performed in our department between February 1997 and June 2001. All were in patients with osteoarthritis of the knee. Standard conservative non-operative treatment had failed in all patients. Seventy-one operations, in 67 patients, were performed under local (Group "L"), 65 under general (Group "G") and 65 under peridural (Group "P") anaesthesia. In three patients in Group L, the operation was repeated after 18, 24 and 70 months respectively, due to recurrence of symptoms; one patient had both knees operated on. The demographics and all other pertinent data concerning the patients of all three groups are shown in table I.

Preoperative investigation included a complete physical examination, standard blood tests, a chest radiograph and ECG, a medical record investigation and a Psychological Profile Determination by interview. When in doubt, appropriate advice was sought. All patients in Group L were in good health, apart from their osteoarthritis problem ; they all agreed to undergo the operation under local anaesthesia and they were found to be emotionally and psychologically able to undergo the operation under local anaesthesia. Those who were felt to be emotionally labile or to have a poor tolerance for even minor discomfort were scheduled for general or peridural anaesthesia.

Preoperative symptoms were recorded as "mechanical" (sudden localised pain, locking or giving way) or "loading" (poorly localised pain or aching pain on weight bearing) symptoms. Preoperative functional ability (endurance, difficulty with steps and use of cane) and physical examination findings (effusion, localised tenderness, ligament laxity and knee function) were also noted (tables II, III & IV).

The extent of articular degeneration was classified according to Fairbank *(8)*, based on preoperative radiographs. Degenerative changes such as tibial spine spurring, marginal osteophytes, femoral and tibial condyles flattening, and joint space narrowing were recorded. Absence of degenerative changes constituted Grade 0, patients with only one change were categorised as Grade I, two or three changes as Grade II and all 4 changes as Grade III. All grades were evenly distributed among the three groups ("Local", "General" and "Peridural").

Arthroscopy was performed under standard general or peridural anaesthesia in patients selected for Group G or P respectively. A tourniquet was not

Table II. – Classification and results of the Local Anaesthesia Group (Group "L") patients

Parameter	Variable	Knees (Nr.)	Knees (%)	…of which excellent results in (nr.)	… of which excellent results in (%)
Symptoms Category	Mechanical problems (sudden onset)	26	36.6	17	65.4
	Loading symptoms (gradual onset)	45	63.4	13	28.9
Motion	Full range	28	39.4	18	64.3
	Limited range	43	60.6	12	27.9
Fairbank changes preoperative radiographs Classification[8]	Grade 0	9	12.7	22	64.7
	Grade I	25	35.2		
	Grade II	28	39.4	8	21.6
	Grade III	9	12.7		
Varus Femoro-tibial angle	0°-8° (mean of : 2°)	17	24	1	5.9
Outerbridge (1961) classification[21]	Grades I & II	9	12.7	7	77.7
	Grade III	20	28.2	10	50
	Grade IV	42	59.1	13	31
Damage Location	Unicompartmental	36	50.7	18	50
	Bicompartmental	29	40.9	11	38
	Tricompartmental	6	8.4	1	16.6

Table III. – Classification and results of the General Anesthesia Group (Group "G") patients

Parameter	Variable	Knees (Nr.)	Knees (%)	…of which excellent results in (nr.)	… of which excellent results in (%)
Symptoms Category	Mechanical problems (sudden onset)	21	32.3	14	66.6
	Loading symptoms (gradual onset)	44	37.8	13	29.5
Motion	Full range	25	38.4	17	68
	Limited range	40	61.6	10	25
Fairbank changes preoperative radiographs Classification[8]	Grade 0	8	12.3	20	62.5
	Grade I	24	36.9		
	Grade II	25	38.5	7	21.2
	Grade III	8	12.3		
Varus Femoro-tibial angle	0°-8° (mean of : 2°)	14	21.5	2	14.2
Outerbridge (1961) classification[21]	Grades I & II	8	12.3	6	75
	Grade III	18	27.7	10	55.5
	Grade IV	39	60	11	28.2
Damage Location	Unicompartmental	34	52.3	18	53
	Bicompartmental	26	40	9	34.6
	Tricompartmental	5	7.7	0	0

Table IV. – Classification and results of the Peridural Anaesthesia Group (Group 'P') patients

Parameter	Variable	Knees (Nr.)	Knees (%)	…of which excellent results in (nr.)	… of which excellent results in (%)
Symptoms Category	Mechanical problems (sudden onset)	20	30.8	13	65
	Loading symptoms (gradual onset)	45	69.2	15	33.3
Motion	Full range	26	40	16	61.5
	Limited range	9	60	12	30.8
Fairbank changes preoperative radiographs Classification[8]	Grade 0	7	10.8	20	66.6
	Grade I	23	35.4		
	Grade II	27	41.5	8	22.9
	Grade III	8	12.3		
Varus Femoro-tibial angle	0°-8° (mean of : 2°)	15	23.1	0	0
Outerbridge (1961) classification[21]	Grades I & II	8	12.3	7	87.5
	Grade III	18	27.7	9	50
	Grade IV	39	60	12	30.8
Damage Location	Unicompartmental	35	53.8	18	51.4
	Bicompartmental	26	40	9	34.6
	Tricompartmental	4	6.1	1	25

used in any patient. A 4-mm, 30° arthroscope was used in all patients. Inflow of irrigation fluid through the arthroscope was facilitated with an infusion pump. Two portals were used in all cases. Monitoring of ECG and blood pressure was standard in all cases during the entire duration of the procedure.

In Group "L" patients, the knee arthroscopy was performed under local anaesthesia. In all these patients and prior to their transfer to the operative room, 0.05 mg/kg of Midazolam was administered intramuscularly. After adequate skin preparation and draping, the knee joint was punctured and an occasional hydarthrosis was drained. Following this, 20ml of Ropivacaine 7.5 mg/ml + 10cc Lidocaine 2% was injected into the joint [Bupivacaine 0.5% (10ml) was administered instead of Ropivacaine, until the latter was commercially available in our country in 1999]. The skin area around each portal was infiltrated with 5-7 ml of Lidocaine 2% + Adrenaline 1 : 80.000. The femur was stabilised into the holder and the arthroscopy procedure was started.

During the operation, which usually lasted around 30 minutes (range, 20 to 40 minutes), Group L patients only felt temporary discomfort at the ankle and at the level of the thigh holder during manipulation. All patients were encouraged to follow the procedure on the TV screen to keep them calm and distracted. Group L patients were asked to flex and extend the knee to assess dynamic alignment and sliding of the patella in the trochlear groove. In areas with localised inflammation and tenderness or when bleeding was noted, an additional dose of 2 ml Lidocaine 2% + Adrenaline 1 : 80.000 was administered via a Nr 14 spinal-peridural needle under arthroscopic control. If the patient felt pain or severe discomfort during the arthroscopic procedure, the knee joint was drained, a subsequent intra-articular infusion of 10 ml of Ropivacaine 7.5 mg/ml was administered and after 5 minutes the operation could be resumed. The two portals were closed with sutures and 10 ml of Ropivacaine 7.5 mg/ml were infiltrated subcutaneously.

Intra-operative findings were recorded in all patients : meniscal lesions, loose bodies, ligament condition and areas of articular cartilage damage. Articular damage was classified according to the "Outerbridge" four-grade scale *(11)* : Grade I indicated softening and blistering of the articular carti-

Table V. – The Baumgaertner *et al (1)* nine-point evaluation scale

Variable	Result	Points (pts)
Pain	Markedly reduced/ absent Less, still significant No change Worse	3 2 1 0
Function	Doing more Doing the same – more easily Doing the same Doing less	3 2 1 0
Patient enthusiasm	Extremely pleased Would do it again Would not do it again Dissatisfied	3 2 1 0
SCORE		
Excellent : 9 pts	Good : 6-8 pts	Fair: 4-5 pts / Failure : 3 pts

Table VI. – Results according to the Baumgaertner *et al (1)* scale

Grading	Number of Knees		% of knees
Excellent	Group L Group G Group P	30 27 28	42.2 41.5 43.1
Subtotal for all groups		85	42.3
Good	Group L Group G Group P	25 24 26	35.2 36.9 40
Subtotal for all groups		75	37.3
Fair	Group L Group G Group P	9 10 10	12.7 15.4 15.4
Subtotal for all groups		29	14.4
Fail	Group L Group G Group P	7 4 1	9.9 6.2 1.5
Subtotal for all groups		12	6

lage, Grade II fragmentation and fissuring in an area ≤ 1.5 cm in diameter, Grade III fragmentation and fissuring in an area ≥1.5 cm and Grade IV represented cartilage erosion down to the bone. The medial femoral condyle together with the medial tibial plateau were considered as one compartment, the lateral femoral condyle together with the lateral tibial plateau were considered as the lateral compartment and the patellofemoral joint was considered as the femoropatellar compartment. Lesions were classified as unicompartmental, bicompartmental or tricompartmental (tables II, III & IV).

The knee joint was thoroughly washed with 3 litres of sterile saline and all intra-articular debris and free osteochondral or articular cartilage fragments were removed. Meniscal lesions were addressed by conservative partial meniscectomy, preserving as much stable meniscal tissue as possible. Meniscal repair was not attempted. Grade III and IV articular cartilage defects were debrided with mechanical shavers and arthroscopic basket forceps ; unstable cartilage flaps located at the periphery of the lesion were removed. Abrasion arthroscopy was never performed. Isolated chondral defects greater than 1 cm in diameter were micro-fractured with an appropriate instrument. Overall and in all 197 patients, we performed 173 partial meniscectomies, 192 articular cartilage trimmings, 119 micro-fractures and 201 lavage procedures.

Twelve (Group L : n = 5, Group G : n = 4, Group P : n =3) minor intra-operative complications were noted (hypotension that responded well to intravenous fluid administration). No major unexpected postoperative complications were encountered. Haemarthrosis developed in 49 cases (Group L : n = 18, Group G : n = 17, Group P : n = 14), of which 36 (Group L : n = 14, Group G : n = 12, Group P : n = 0) had to be drained.

Group L patients were allowed partial weight bearing on crutches two hours after surgery and they were discharged the following day. The patients stayed in hospital overnight for reasons of social security and hospital regulations. Group G and P patients were allowed partial weight bearing (according to the anaesthesiologists' decision) 8 and 24 hours after surgery respectively and they were discharged after 3 and 2 days respectively. All patients were allowed to gradually progress to full weight bearing after a period of 2 to 3 weeks.

Statistical Methods

Statistical analysis was performed by the "Oneway ANOVA" test for the simultaneous comparison of the results of all three groups. We calculated the F-ratio (null hypothesis : F and α). Furthermore the results in the local anaesthesia group were compared independently to those in the general anaesthesia and the peridural anaesthesia groups with the use of individual "T-tests". Statistical significance was determined for all tests at $p = 0.05$.

RESULTS

Patients with "mechanical problems" and sudden onset of symptoms (i.e. sudden localised pain, locking or giving way) responded better to this operation (65.7% excellent results) than patients experiencing 'loading symptoms' with a more gradual onset (30.5% excellent results). Results were excellent in 64.5% of the patients with pre-operative full range of motion, compared with only 27.8% of patients with restricted motion (mean of 10° impairment in knee extension and 20° in knee flexion movements) prior to the surgery (tables II, III, IV).

Pre-operative radiographic assessment according to the Fairbank *(8)* classification seems to be important, as 64.6% of Grade 0 and Grade I patients achieved excellent results, versus 21.9% of Grade II & III patients. Varus malalignment is a predictor for poor outcome, as only 3 patients out of 46 (6.5%) with such deformity had excellent post-operative results.

Intra-operative grading of degenerative changes according to the "Outerbridge" four point-scale is a valuable method of assessment of the surgical outcome, as only Grade IV lesions were found to respond poorly to treatment (excellent results in 30%) while Grade III and Grade I & II patients responded much better (excellent results in 51.8% and 80% respectively).

Finally we should mention that, as expected, the extent of the osteoarthritic lesions found at arthroscopy is of particular interest : in tricompartmental lesions, only 2 out of 15 patients had 'excellent' results. Patients with uni- or bicompartmental lesions seemed to respond better to the arthroscopic debridement under local anaesthesia as they reported excellent results in 51.4% and 35.8% respectively.

The initial operations for the 3 patients that were re-arthroscoped (table VII, knees #L019, #L022 & #L028) were categorised as failures. The results of the second operations were categorised as 'fair' (table VII, knees #L052, #L062 & #L068). The result for the patient's contralateral knee, who had his other knee operated on twice (knees : #L022 & #L052), was categorised as 'fair' (#L068).

Comparing results of all three groups (with the "One way ANOVA" test), we found no statistically significant difference between them ($p = 0.710$, $F = 0.343$, null hypothesis is true). We also found no difference in the results of our patients when we compared (with individual "T-Tests") Group L with Group G ($p = 0.880$) and Group L with Group E ($p = 0.429$).

DISCUSSION

Non-operative treatment methods used in knee osteoarthritis usually aim at reducing pain associated with joint inflammation and functional impairment. When non-operative methods are ineffective, surgery may be considered. Surgical options include arthroscopic debridement, realignment osteotomy, unicompartmental and total knee arthroplasty.

Arthroscopic debridement appears to be useful in patients with minor radiological changes and minor or absent malalignment, particularly when mechanical symptoms predominate or when pain and effusion are out of proportion to the clinical and radiological signs *(1,11)*. Arthroscopic debridement for symptomatic degenerative arthritis has provoked much discussion *(3,23)* and the role of arthroscopy in the management of degenerative knee arthritis, in the middle-aged yet active patient, remains controversial *(4,20)*. Wai *et al* *(27)* believe that arthroscopic debridement may have been overutilised, especially in older patients.

On the other hand, several studies report good results with arthroscopic debridement *(1,5,12,24,26,*

28) in patients with mild to moderate articular degeneration, even with arthroscopic lavage alone *(15).* In well-selected patients, arthroscopic debridement may be of value to provide transient relief of symptoms *(19).* Dervin *et al (6)* studied 126 patients who underwent arthroscopic debridement for the treatment of knee osteoarthritis ; they reported that 44% of them reported a clinically important reduction in pain at 2 years after the surgery. Jackson and Dietrichs *(13)* concluded that 92.5% of Stage I (softening) and Stage II (fibrillation) knees had excellent and good results compared with 29.6% of Stage III (fragmentation) and Stage IV (eburnation) knees.

Jacobson *et al (14)* studied 400 arthroscopic procedures, of which 200 were performed under local, 100 under general and 100 under spinal anaesthesia. They concluded that in 92% of all patients candidate to local anaesthesia, the knee arthroscopy could be performed without any difficulties or problems. In the remaining 8% the operation was completed under general anaesthesia. In our series, all operations in group "L" were completed under local anaesthesia.

As the outcome of the arthroscopic debridement of the knee for the treatment of osteoarthritis seems to depend mainly on the extent of the already existing degenerative lesions, the main target of this study was not to test the efficacy of this procedure, but to check that the results of this procedure, when performed under local anaesthesia, are similar to those obtained when general or peridural anaesthesia is elected. Our study suggests that the type of anaesthesia does not seem to interfere with the results of the surgical treatment.

Furthermore, knee arthroscopy under local anaesthesia appears as a brief and cost-effective surgical procedure that apparently has a low risk for intra- and post-operative complications. Lintner *et al (15)* in a retrospective review of 256 knee arthroscopies performed under general-endotracheal, regional (peridural or spinal) or local anaesthesia, found that the difference between operative and total anaesthetic time for the 'local anaesthesia' group was 35 and 23 minutes less, compared with the 'regional' and 'general' group respectively. Nineteen complications were noted among the 'general anaesthesia' group , 16 among the 'regional' and only 2 among the 'local'. Moreover, local anaesthesia saved a minimum of $400 per case, compared to the other two anaesthetic methods.

On the other hand, operative arthroscopy in the knee under local anaesthesia demands a certain level of proficiency and experience on the part of the surgeon in order for the procedure to be safe and effective (*25).*

To conclude, we found that arthroscopic debridement of the osteoarthritic knee under local anaesthesia is an efficient, easy, brief, safe, painless and cost-effective method of surgical treatment, especially when performed in the early stages of osteoarthritis. It provides temporary remission of pain and improvement of function, without interfering with the underlying pathologic process and its natural evolution. Local anaesthesia renders arthroscopic debridement a minor, thus repeatable surgical intervention that actually postpones the need for a major surgical procedure such as tibial osteotomy, unicompartmental or total knee arthroplasty.

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