Synovectomy of the knee in rheumatoid arthritis

I. Range of movement and quadriceps lag after surgery

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The first report of synovectomy in rheumatoid arthritis appeared as early as 1887. Until 1940 the operation was performed for many and varied conditions with few analyses of results. After a 50 per cent. failure rate had been reported in rheumatoid arthritis (Ghormley and Cameron, 1941) the operation was performed only rarely for a further 20 years. More evidence against the value of the operation was provided in a detailed statistical analysis by London (1955), which showed a significant recurrence rate after a few years. In the past 10 years interest in surgery for rheumatoid arthritis has been renewed and many good retrospective studies of knee synovectomy have been published. These were critically analysed by Paradies (1969) and Geens (1969). No firm conclusions were reached by these authors about the benefits of synovectomy although there was general agreement that loss of pain and swelling would be found in about 70 per cent. of patients for up to 2 years after surgery. It is hoped that the prospective controlled studies being conducted in Great Britain and the United States of America will provide the answers to many questions (Leading article, 1969). A survey of the literature, however, shows widespread disagreement about pre- and postoperative management and the effect of operation on the range of movement. Paradies (1969) reported that 80 per cent. of his patients lost flexion by an average of 28 per cent. of the preoperative range and that 50 per cent. lost extension by an average of 14 per cent. He attributed this loss to destructive changes in the joints at the time of surgery and to the fact that manipulation of the knee was not performed after synovectomy. Geens, Clayton, Leidholt, Smyth, and Bartholomew (1969), however, found that their patients, comparable in the extent of joint destruction with those of Paradies (1969), did not lose a significant range of movement although manipulation was not performed. Vainio (1969), who has published the largest series of knee synovectomies, found that the range of movement at the knee after surgery depended chiefly upon the state of the cartilage at the time of operation.

To resolve some of these doubts, it was decided to make a prospective study of the effect of knee synovectomy on the range of movement and quadriceps function in a group of patients in whom the pre- and postoperative care was standardized. The purpose of the study was to establish the normal range of movement at varying periods after the operation and to correlate the range reached and quadriceps function with age, disease activity, and joint destruction.

Clinical material and methods

Between 1960 and 1969 a total of 110 knee synovectomies was performed at Stoke Mandeville Hospital; 32 were bilateral operations and the study therefore concerns 78 patients (16 males and 62 females). Part I of the study is concerned with a consecutive series of 57 knees from the larger group subjected to synovectomy between June, 1967, and 1969. The composition of the whole group, for which the long-term results are reported in Part II, is described here together with the operative technique and postoperative management.

The age range of the patients is shown in Table I. The mean age was 45 years. The average duration of disease

Table I Age Distribution of patients

Age (yrs)	Number of knees
10-20	3
21-25	1
26-30	9
31-35	12
36-40	7
41-45	10
46-50	11
51-55	15
56-60	17
61-65	12
66-70	7
71-75	5
76-80	1

Accepted for publication October 7, 1971.

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was 13 years. Two patients had juvenile rheumatoid arthritis, one had systemic lupus erythematosus, and 75 had classical or definite rheumatoid arthritis.

All cases were assessed preoperatively by a rheumatologist and an orthopaedic surgeon and were admitted under their combined care. The indications for operation were pain, effusion, and synovial thickening persisting for 6 months or longer despite conservative treatment. The pre- and postoperative care, medical treatment, and physiotherapy were the same for all patients. The number of patients in Part I of the study who were having corticosteroid treatment (daily dosage not exceeding 10 mg. prednisolone) is shown in Table II.

The incision was either bilateral parapatellar or medial parapatellar. The suprapatellar pouch was completely removed and the medial and lateral gutters cleared. The patella was dislocated and the knee flexed to remove synovium from the intercondylar notch. The semilunar cartilages were removed if damaged (5 knees). Patellectomy was not performed; five knees had a popliteal cyst removed via a posterior approach at the time of synovectomy. In the other cases, the posterior aspect of the joint was not cleared.

Active quadriceps drill was given for at least 2 days before the operation. The knee was immobilized postoperatively by a firm dressing composed of a layer of foam rubber under a bandage extending from the ankle to the mid-thigh. Active flexion was not encouraged in the early postoperative stages though the dressing allowed 20 to 40° of flexion. Quadriceps drill was continued throughout the postoperative period and straight-leg raising was usually possible on the first or second postoperative day. At first the bandage was removed on the 10th day and bending of the knee encouraged. Partial weight bearing was started on the 10th to 14th day and full weight-bearing before the 21st day. Later this programme was modified, the bandage being removed on the 7th day and non-weight-bearing exercises allowed if the patient's general condition was good. The knee was manipulated under anaesthesia 3 weeks after synovectomy in four patients; one has since had another manipulation. It has not been the policy to manipulate the knee routinely after synovectomy. The patients were discharged after an average of 21 days.

Results

The operative complications are shown in Table II. No wound required resuturing and only the wound infection and haemarthroses required special treatment. There was no significant difference in the incidence of complications between the corticosteroid treated patients and the rest.

QUADRICEPS LAG

A summary of the patients with quadriceps lag is given in Table III. Seven patients had a measurable lag preoperatively and seventeen had a postoperative lag. One patient had a quadriceps lag only preoperatively. At their last follow-up appointment only five patients had a quadriceps lag, none more than 8°.

The seventeen patients fell into four groups.

- (1) Four patients under the age of 35 years without active systemic disease. The lag was abolished by supervised physiotherapy before or just after leaving hospital.
- (2) Five patients aged 65 years or over with weak muscles, four of whom had a quadriceps lag preoperatively and in all of whom the lag disappeared before discharge from hospital.
- (3) Three patients in whom the synovectomy was late, as evidenced by destruction of the joint surfaces, lateral instability, and advanced radiographic changes. In all these patients the lag was present before operation and was still present one year later.
- (4) Five patients with active generalized disease in three of whom the lag disappeared when the disease activity was controlled and in two of whom it is still present with active disease.

This group included one patient in whom the quadriceps lag developed 3 months after operation and increased steadily until her admission to hospital for treatment with corticotrophin and hydroxy-chloroquine. It then disappeared only to reappear

Table II *Complications of Surgery*

Complications	Treatment		Total no. of knees
	Corticosteroids	No corticosteroids	
Wound infection	1	0	1
Haemarthrosis	2	0	2
Wound haematoma	5	1	6
Deep venous thrombosis	1	0	1
Wound breakdown	7	3	10
Total	16	4	20
Cases with no complications	28	9	37
Total knees	44	13	57

Table III *Quadriceps lag*

<i>Patients</i>	<i>Quadriceps lag</i>			<i>Total no. in group</i>
	<i>Preoperative</i>	<i>Postoperative</i>	<i>Still present</i>	
Age under 35 with inactive disease	0	4	0	5
Age over 65 years	4	5	0	9
Late synovectomy	3	3	3	11
Active systemic disease	0	5	2	12
All other patients	0	0	0	20
Total	7	17	5	57
Number without lag	39	Total number of knees		57
Number with lag	18			

one year later when the disease again became very active. The lag finally responded to measures which reduced disease activity.

RANGE OF MOVEMENT

The measurements were made almost entirely by one observer, before operation, and 10 days, 14 days, 21 days, 3 months, 6 months, and 1 year thereafter. For each knee the range of movement was expressed as a percentage of the preoperative range. The Figure shows the mean of these observations with one standard deviation above and below. These limits were used to define the normal range of movement in this group of patients. The mean range of movement increased steadily to 100 per cent at six months and continued to rise at a slower rate over the next 6 months.

The observations at 21 days and 3 months were sub-divided according to age group (Table IV). At each of these periods the mean range of movement of patients aged 40 years and under was very much less than the corresponding figure for any of the other groups or for the total sample, and this difference was significant at the 5 per cent level. No other significant differences between the groups were found.

Among patients aged 41 years and over there were

FIGURE *Mean range of movement with one standard deviation.*

twelve knees in which the range fell below normal at 21 days. Only five knees remained outside the normal range at 6 months and 1 year. The operation in all five knees was a late synovectomy, since the bones were found to be grossly denuded of cartilage. All

Table IV *Range of movement as percentage of preoperative range $\pm$ S.D.*

<i>Age (yrs)</i>	<i>No. in group</i>	<i>Time of observation</i>					
		<i>10 days</i>	<i>14 days</i>	<i>21 days</i>	<i>3 mths</i>	<i>6 mths</i>	<i>1 yr</i>
All ages	57	38 $\pm$ 18	56.6 $\pm$ 24	67.3 $\pm$ 24	90.2 $\pm$ 22	102.1 $\pm$ 26 (30 knees)	105.4 $\pm$ 26 (40 knees)
40 and under	10			50.7 $\pm$ 22	75.2 $\pm$ 18		
41-50	17			69.8 $\pm$ 23	89.5 $\pm$ 16		
51-65	20			68.6 $\pm$ 26	96.4 $\pm$ 29		
Over 65	10			77.3 $\pm$ 18	93.0 $\pm$ 10		

these patients lost their pain and swelling initially but later some degree of pain recurred. One patient has had two manipulations with no benefit and also has a quadriceps lag. One patient has been admitted for further surgery to the knees. Apart from these five patients, only two others had less movement at 1 year than they had before the operation. One is still slowly regaining movement. The other did not comply with the postoperative programme in that he was too active and developed a severe generalized flare-up in all joints. This patient lost a small amount of extension as did a second patient who maintained his overall range of movement after bilateral synovectomy but whose severe patello-femoral arthritis later necessitated patellectomy on one side. In none of the four patients who had a manipulation did this make any difference to their overall progress. There was no correlation between disease activity and range of movement in any patient.

Discussion

The importance of quadriceps lag after knee synovectomy and the factors responsible have hitherto received little attention. The result of any operation will be prejudiced if it leads to instability through muscular weakness, and this is particularly so in the knee joint. Quadriceps lag is preventable by careful attention to active exercises and this study identifies three groups of patients to whom particular care should be given, those under 35 years, those over 65 years, and those with active systemic disease. Although the numbers reported here are small, it seems clear that control of systemic disease activity is important in preventing quadriceps lag. In patients in whom the synovectomy is late, quadriceps lag will persist despite vigorous physiotherapy.

In this series the proportion of patients who lost a significant amount of flexion postoperatively is much the same as that reported by Geens and others (1969) but less than that found by Paradies (1969). With early mobilization only a very few patients lost movement and in these the state of the joint at operation rather than the postoperative management determined the result. These conclusions are in agreement with those of Vainio (1969). It may be, however, that in this group of patients synovectomy was performed earlier than at some other centres, since in 24 out of 57 knees the synovectomy was classed as early, com-

pared with only ten out of 52 in Paradies' series. On the other hand, nine of these 24 operations were carried out in patients under the age of 40 years, who were shown to regain range of movement very slowly postoperatively.

The reasons for the initially slow gain of movement in young patients are not clear. At the end of a year from the time of the operation there was no longer any significant differences between those under and those over 40 years of age. Possibly young patients have a more vigorous healing response resulting in stiffness or have a lower threshold to pain. Most of them had had the disease for only a short time localized in a few joints, were not used to pain and stiffness, and were therefore more reluctant to move their knees after operation.

From these results it seems that early mobilization and quadriceps exercises can influence the short-term results of knee synovectomy if the joint cartilage is well preserved. The range of movement achieved and the quadriceps function depend not only on careful attention to physiotherapy but also on the state of the knee joint and the nature of the disease in individual patients at the time of operation. This study shows that a good range of movement can be achieved after synovectomy of the knee without the use of routine manipulation under anaesthesia.

Summary

- (1) The results are reported of knee synovectomy in 57 patients with rheumatoid arthritis.
- (2) Quadriceps lag was noticed in eighteen patients but has persisted in only five. Young patients, those over 65, and those with active systemic disease were found to be particularly liable to develop a quadriceps lag.
- (3) Range of movement was lost after surgery by seven patients, in five of whom the synovectomy was considered to be late. Patients aged 40 years and under were significantly slower than older patients to regain movement in the first 3 months after surgery.
- (4) A postoperative programme with emphasis on early mobilization and active physiotherapy is described.

I wish to thank Dr. A. G. S. Hill for his help in preparing this paper and Mr. J. E. Camp for providing the statistical analysis.