Prophylactic synovectomy of the joints of the rheumatoid hand

Clinical trial with 4 to 8-year follow-up

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Prophylactic synovectomy of the joints of the hand has gained widespread acceptance among certain surgeons in recent years (Kessler and Vainio, 1966; Paul and Flatt, 1969; Ansell, Harrison, Little and Thouas, 1970). The benefit of such surgery is viewed with greater caution by the rheumatologist who has, through long experience, witnessed the slow and relapsing progression of this crippling disease: he is also aware that synovectomy was practised as long ago as 1887 (Schüller, 1893), and did not then gain general acceptance. Relief of pain and improved function are usually apparent shortly after surgery, but the long-term benefits are more difficult to assess and have needed adequate years of follow-up.

A sufficient number of our hand cases now exist with long-term follow-up to provide a detailed assessment of prophylactic synovectomy of the metacarpophalangeal joint. For this purpose all cases treated from 1962 to 1966 are included (Table I), thus providing a 4 to 8-year follow-up, and represent all those hand cases referred for surgery from the combined surgical and medical rheumatoid hand clinic.

Table I *Total number of joint synovectomies, 1962-1966*

Synovectomy	Side		Total
	Right	Left	
(a) Wrist	7	5	12
(b) PIP	10	3	13
(c) MCP	60	42	102
Total	77	50	127

Methods of study

In addition to the data provided by regular follow-up visits to the rheumatoid hand clinic, a special questionnaire was compiled so that a critical assessment by an independent surgeon and the opinion of the patient

himself could be obtained. In order to complete this study all patients were recalled, and details of their history were reviewed, including their medical management and any factors relating to progression of their disease. Examination included measurement of joint movements, clinical and radiological assessment of the hands and wrists, and a record of the presence of serum rheumatoid factor. The main purpose of this study was to examine the results of metacarpophalangeal synovectomy, but it was felt worthwhile to include the results of wrist and proximal interphalangeal synovectomy although these were much fewer in number and therefore of less statistical value.

Material

The study included 37 patients (29 women and 8 men), all of whom required synovectomy of at least one joint of the upper limb, including elbow, wrist, or joints of the hand. Their average age at the time of surgery was 49.5 years. All were Caucasians with the exception of two Asians. The group of patients had attended regularly as out-patients but were recalled for special assessment during a 10-week period.

The 27 patients who required metacarpophalangeal joint synovectomy are included in the total of 39 patients. They were very similar to the group as a whole; there were 21 women and 6 men and the average age at the time of synovectomy was 48.8 years.

Results

(A) WRIST SYNOVECTOMY

This was performed in twelve cases (7 right-sided and 5 left-sided). Of these, 75 per cent. showed symptomatic improvement although more than half showed x-ray evidence of progression of their disease. The results reflect the treatment of mainly advanced cases where fusion would now be more frequently combined with synovectomy.

(B) PROXIMAL INTERPHALANGEAL JOINT SYNOVECTOMY

This was carried out in only thirteen joints, all in rather long-standing cases with marked bony changes already present. This number of cases was not considered sufficient for further analysis.

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(C) METACARPOPHALANGEAL JOINT SYNOVECTOMY

A total of 102 synovectomies was performed in 27 patients (21 women and 6 men). Eleven of these underwent bilateral synovectomy. Their average age at the time of surgery was 48.8 years and the average duration of symptoms in the hands before synovectomy was 9.5 years. However, this latter figure was further analysed to show that the average period between onset of disease and surgery was 14.7 years in patients treated before 1966 and only 3.8 years in those treated during 1966.

Prognosis (Table II)

Of the 38 hands undergoing MCP synovectomy, 35 experienced relief of pain, weakness, and stiffness, with resultant functional improvement. Recurrence of ulnar drift where present recurred in three out of six cases, and joint subluxation recurred in two out of six. During the period of follow-up, clinically recorded synovitis occurred in fourteen unoperated MCP joints (8.4 per cent.) and elsewhere in other joints of the hand or wrist in a further twenty cases. In contrast to these figures recurrent synovitis was observed in only six out of the 102 MCP joints, which had previously had synovectomy.

Table II Results of MCP joint synovectomy (38 hands) in 27 patients

Result	Numbers
Relief of pain, weakness, stiffness	35 of 38
Improvement in function	35 of 38
Recurrence of ulnar drift of subluxation	3 of 6 2 of 6
Development of synovitis in unoperated MCP joints	14 of 168
of synovitis and erosions elsewhere in hand or wrist	20
Recurrence of synovitis in operated MCP joints	6 of 102

Clinical assessment (Table III)

The assessment by the surgeon was based on improved function, symptomatic improvement, x-ray changes, and arrest of the synovitis. A high proportion were rated very good with only one poor result, which can be seen to correspond closely with the patients' subjective assessment based on relief of pain and swelling as well as on improved function and appearance.

Radiological assessment (Table IV)

Comparative x rays accumulated over a number of

Table III Subjective and objective clinical assessment in 38 hands

Patient (subjective)		Surgeon (objective)	
Improved	35	Very good	31
No change	2	Fairly good	6
Worse	1	Poor	1
<i>Based on:</i>		<i>Based on:</i>	
Relief of pain, swelling		Improved function	
Improved function		Symptomatic improvement	
Improved appearance		X-ray changes	
		Arrest of synovitis	

years provided data for a most valuable means of assessment and the results are recorded in Table IV. The presence of soft tissue swelling, deformity, osteoporosis, and joint erosions were all recorded, but the latter proved much the most significant index.

Table IV X-ray findings after synovectomy of 102 MCP joints

Time of x ray	Erosions			
	None	Minimal +	Moderate ++	Severe +++
Before synovectomy	35	29	21	17
After synovectomy (4 to 8 years)	35	22	22	23

A system of grading for joint erosions was employed: + signified minimal evidence of erosions, ++ indicated multiple erosions with only slight articular cartilage involvement, and +++ included multiple severe articular erosions or gross articular degeneration. Joints showing no erosions at the time of synovectomy remained free of erosions in all cases. By contrast, those already showing x-ray evidence of erosions at the time of surgery showed a gradual progression towards further degenerative changes.

Rheumatoid factor, demonstrated by sensitized sheep cell agglutination, and latex fixation was found to be positive in 24 of the 27 patients undergoing MCP joint synovectomy. The three cases with a seronegative rheumatoid factor showed a disease pattern similar to the other cases, but a positive serum rheumatoid factor demonstrated in the remainder is significant, this being associated with a more severe or rapid development of joint erosions (Hollander and Rawson, 1968).

Discussion and conclusion

There is much that we still do not know about the aetiology of rheumatoid arthritis, and any evidence produced to demonstrate the benefit of synovectomy

must be considered in relationship to these other areas of uncertainty. The significance of a demonstrable serum rheumatoid factor remains unclear although much circumstantial evidence exists to support the belief that these patients show more severe joint destruction. Hollander and Rawson (1968) have shown experimentally that this plays a role in perpetuating joint inflammation.

Much research has indicated that erosion of cartilage results predominantly from the enzymatic degradation of its constituents (Weissmann, Spilberg, and Krakauer, 1969; Whaley and Dick, 1969). There is increasing evidence that the synovial cells are responsible for the release of these lysosomal enzymes, which have been found in increased levels in rheumatoid synovial effusions (Kerby and Taylor, 1967). The demonstration of a collagenase prepared from tissue cultures of rheumatoid synovium has pointed to another possible mechanism of cartilage erosion by synovium (Evanson, Jeffrey, and Krane, 1968), although others have questioned its significance since synovial biopsies have been shown to contain collagenase also in conditions other than rheumatoid arthritis (Harris, Cohen, and Krane, 1969).

Because of these uncertain aspects of the aetiology and pathogenesis of rheumatoid joint degeneration, it is of great importance for surgeons performing synovectomy to produce a critical assessment of long-term results. Prospective multicentre trials are currently going on in Great Britain and the USA but as yet without results. Symptomatic improvement following synovectomy has long been recognized (Gariépy, Demers, and Laurin, 1966; Stevens and Whitefield, 1966), but this in itself has made a controlled trial difficult for both the surgeon and the patient to accept, knowing full well the relief of symptoms denied the unoperated hand.

A retrospective study of 102 MCP joint synovectomies performed between 1962 and 1966 represents cases treated at a time when rheumatologist and surgeon viewed surgical synovectomy with conservatism and chose to perform the operation only on joints with obvious involvement, declining to explore the MCP joint in adjacent fingers of the same hand if apparently uninvolved. This has resulted in an interesting group of joints for retrospective study, in which only 102 metacarpophalangeal joints underwent surgical synovectomy, leaving 168 unoperated joints, which were thus available for comparison over

FIG. 1 49-year-old male with seropositive rheumatoid arthritis of 18 months' duration. X ray of hands taken in 1964. Synovectomy of the circled joints of the right hand was performed in 1963 and of the circled joints of the left hand in 1966.

the subsequent years of follow-up.

There are no precise criteria by which we can judge the relative merits of prophylactic synovectomy, but a 4 to 8-year follow-up does provide an opportunity for clinical assessment both by an independent hand surgeon, and by the patient. A radiological assessment is also valuable even if many of the changes do not become visible until comparatively late.

Functional and symptomatic improvement has been clearly demonstrated and is summarized in Table III. These patients have managed to retain a fair to excellent degree of manual dexterity, continuing to do all or much of their own housework, or other employment comparable with their age.

In order to determine more accurately the effect of prophylactic synovectomy, a study was directed towards evidence of recurrent deformity, radiological evidence of disease progression, and a comparison of subsequent synovitis in the operated with the non-operated joints.

The selection of cases suitable for synovectomy between 1962 and 1966 was certainly more conservative than in recent years, so that it is fair to comment

at this point that many of the patients would have shown better results if treated before deformity or bony erosions had become so advanced.

The high incidence of recurrent ulnar drift and joint subluxation shows the need for more elaborate surgical correction, and consequently it is already established practice in this centre to perform transfer of the ulnar dorsal interossei insertions to the radial aspect of the adjacent fingers as described by Vainio (1969) as well as the more traditional procedures of intrinsic muscle release, capsular plication, extensor tendon alignment, and transfer of extensor indicis proprius.

A review of serial x rays revealed the insidious progression of joint erosions in MCP joints which clinically had remained sufficiently quiescent to not provoke a decision for synovectomy. Illustrations (Figs 1 and 2) show a typical example of disease progression over a period of 5 years. The circled joints in the right hand showed painful swelling in 1963 and were selected for synovectomy at a time when no erosions were present radiologically. Those of the left hand underwent synovectomy in 1966. Subsequently this arthritis was controlled by

FIG. 2 Appearance of joints of the same hands 5 years later (1969), showing slight deterioration of operated joints of right hand, no progression of disease in operated joints of left hand, but widespread erosions and joint changes in the non-operated metacarpophalangeal joints and also the proximal interphalangeal joints.

standard medications, and the other MCP and PIP joints showed clinically only minimal evidence of low-grade synovitis. X rays taken 5 years later show control of disease in the operated joints, but the occurrence of extensive erosions in the non-operated MCP joints as well as the interphalangeal joints of the thumbs and fingers. This picture was demonstrated in a number of other cases and not only illustrates the great importance of synovectomy even in cases showing relatively little clinical evidence of synovial proliferation, but also (and equally important) it offers us very strong evidence of the natural history in MCP joints if used for 'controls' and not treated by early prophylactic synovectomy. These findings have convinced us of the value of prophylactic synovectomy. Its value becomes even greater if the results of Table IV are considered. In this series 35 MCP joints underwent prophylactic synovectomy at a time before erosions were radiologically visible. During the 4 to 8-year period of follow-up none of these showed evidence of erosions of the articular cartilage or other evidence of progressive joint disease.

The other 67 operated joints showed only a slight deterioration in their x-ray appearance, this being compatible with the degree of joint damage already present, and not due to further synovitis, except in six cases in which recurrent synovitis was recognized.

It is significant that recurrence was found only in these relatively advanced cases in which a thorough synovectomy is technically more difficult. The incidence of recurrent synovitis diagnosed by clinical examination was shown to be 6 per cent. and further supports the successful control of most cases of joint synovitis, especially when contrasted with the relatively higher figure of 8.4 per cent. for subsequent synovitis in non-operated joints (Table II). This suggests that synovectomy of a joint results in a recurrence rate which is no greater than the chance incidence of synovitis developing during the same period in an uninvolved joint.

Summary

A retrospective review is presented of 38 hands undergoing joint synovectomy between 1962 and 1966. This included 102 metacarpophalangeal joint synovectomies. The results were assessed by an independent surgeon and evaluated on clinical as well as radiological data. A 4 to 8-year follow-up period showed only a 6 per cent. incidence of recurrent synovitis compared with an incidence of 8.4 per cent. in non-operated joints which did not show involvement at the time of surgery. Evidence is presented to show the value of prophylactic synovectomy in the control of rheumatoid disease in metacarpophalangeal joints.

References

- ANSELL, B. M., HARRISON, S. H., LITTLE, H., AND THOUAS, B. (1970) *Brit. J. plast. Surg.*, **23**, 380 (Synovectomy of proximal interphalangeal joints).
- EVANSON, J. M., JEFFREY, J. J., AND KRANE, S. M. (1968) *J. clin. Invest.*, **47**, 2639 (Studies on collagenase from rheumatoid synovium in tissue culture).
- GARIÉPY, R., DEMERS, R., AND LAURIN, C. A. (1966) *Canad. med. Ass. J.*, **94**, 1349 (The prophylactic effect of synovectomy of the knee in rheumatoid arthritis).
- HARRIS, E. D., COHEN, G. L., AND KRANE, S. M. (1969) *Arthr. and Rheum.*, **12**, 92 (Synovial collagenase).
- HOLLANDER, J. L., AND RAWSON, A. J. (1968) *Bull. rheum. Dis.*, **18**, 502 (Gamma globulin, rheumatoid factors and rheumatoid arthritis).
- KERBY, G. P., AND TAYLOR, S. M. (1967) *Proc. Soc. exp. Biol. (N.Y.)*, **126**, 865 (Enzymatic activity in human synovial fluid from rheumatoid and non-rheumatoid patients).
- KESSLER, I., AND VAINIO, K. (1966) *J. Bone Jt Surg.*, **48A**, 1085 (Posterior (dorsal) synovectomy for rheumatoid involvement of the hand and wrist).
- PAUL, W. D., AND FLATT, A. E. (1969) In 'Early Synovectomy in Rheumatoid Arthritis', ed. W. Hijmans, W. D. Paul, and H. Herschel, p. 81. Excerpta Medica Foundation, Amsterdam.
- SCHÜLLER, M. (1893) *Langenbecks Arch. clin. Chir.*, **45**, 153 (Synovectomy of the knee joint).
- STEVENS, J., AND WHITEFIELD, G. A. (1966) *Ann. rheum. Dis.*, **25**, 214 (Synovectomy of the knee in rheumatoid arthritis).
- VAINIO, K. (1969) In 'La main rhumatoïde', ed. R. Tubiena, p. 111. Expansion Scientifique Française, Paris.
- WEISSMANN, G. (1964) *Lancet*, **2**, 1373 (Lysosomes, autoimmune phenomena, and diseases of connective tissue).
- , SPILBERG, I., AND KRAKAUER, K. (1969) *Arthr. and Rheum.*, **12**, 103 (Arthritis induced in rabbits by lysates of granulocyte lysosomes).
- WHALEY, K., AND DICK, W. CARSON (1969) *Brit. J. Hosp. Med.*, **2**, 1916 (Rheumatoid arthritis. Aetiological and pathogenic considerations).