The Sublimis Opponensplasty for Median Nerve Paralysed Thumb in Hansen's Disease

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The ubiquitous sublimis tendon had been transferred for loss of opposition of the thumb in one hundred and forty-five hands of one hundred and twenty-two Hansen's Disease patients with median nerve paralysis, between 1972 and 1981 at the Christian Medical College Hospital, Vellore. Restoration of opposition was good in 70.3% and fair in 20.68% of hands. Terminal interphalangeal joint flexion of the thumb was encountered in 18% of the cases as a late feature even in presence of good abduction and internal rotation. As an end stage in itself or in combination with claw finger correction, the procedure greatly contributes to the overall rehabilitative effort so very essential in these patients.

The distal median nerve paralysis commonly seen with proximal or distal ulnar nerve paralysis in Hansen's Disease produces a total claw hand deformity. The thumb is adducted and supinated and constitutes one of several primary deformities that can be encountered in these patients.

A patient with a purely ulnar claw hand may develop new habit patterns that may help him to partly overcome his disablement; but when there is an associated loss of opposition of thumb no amount of substitution patterns in movement can adequately compensate for the amount of functional loss acquired. It is essential that this deformity be corrected early to minimise secondary deformities of ulceration, absorption and contracture that will further add to the misery.

Historically the sublimis as a motor for opponens replacement was first described by Krukenberg in 1921, who used the radial half of the middle finger sublimis. But it was Bunnell (1924) who, while describing the sublimis opponensplasty, emphasized and defined the role of the route and pulley for the success of this tendon transfer. Various other modifications (Thompson 1942, Riordan 1960 and Palazzi 1962) of routing and inserting the sublimis tendon followed thereafter. However, Brand (1966) introduced the concept of sublimis tendon transfer with dual insertion to achieve stabilization of the metacarpo-phalangeal joint, abduction and rotation of the first metacarpal and extension of the distal segment of the thumb.

At the Christian Medical College Hospital, Vellore, sublimis opponensplasty was routinely combined with claw finger reconstruction for claw hand deformity for the last three-and-a-half decades. The results of the sublimis opponensplasty adopting Brand's route and dual insertion are here analysed and presented.

MATERIAL AND METHODS

During a period of ten years between 1972 and 1981, for two hundred and sixty eight hands, opponensplasty was performed at the Christian Medical College Hospital, Vellore. However, one hundred and forty five opponensplasties using the sublimis tendon had beens tudied since all the necessary details were

available for this number and all had a minimum of one year's follow-up after surgery. There were one hundred and twenty-two patients, of whom twenty three had bilateral opponensplasty. There were 102 males and 20 females. The average age of these patients was 30.8 years, the youngest patient being 12 years of age and the oldest 66 years old. Seventy-five of them had borderline type of leprosy, twenty-nine were of the Tuberculoid type and in eighteen patients it was Lepromatous. Records show that all of them were smear negative at the time of surgery and had received sufficient duration of anti-Hansen's Disease treatment before and were continuing their medical treatment. The flexor digitorum sublimis of the ring finger (F.D.S.R.) was used in one hundred and twenty-eight hands and the flexor digitorum sublimis of the middle finger (F.D.S.M.) was used in seventeen. Adjuvant procedures numbered one hundred and fifty-one and are enlisted in Table 1.

Table 1. The adjuvant procedures performed with sublimis opponensplasty

Claw finger correction		*Others*	
E. F. 4. T	58	Thumb web plasty (Brand)	8
E. E. 4. T	13	I. P. arthrodesis	5
P. L. 4. T	3	Dermis graft	2
*S. S. 4. T	60		
Zancolli Capsulorraphy	2		

*S. S. 4. T :—Single sublimis four tails.

The procedure of opponensplasty that was followed is described:

The F.D.S.R. or F.D.S.M., is approached through a mid-lateral incision placed on the radial aspect of the respective P.I.P. joint region of the finger. The tendon is detached just proximal to its insertion. It is withdrawn 5 cms. proximal to the wrist crease. A tunneller is passed from a one cm. transverse incision made just distal and radial to the pisiform bone. Loose fat seen through this incision verifies the presence of the tunneller in the Guyon's canal which serves as the pulley. The tendon is tunnelled subcutaneously from here to an incision made midway between the base and head of the first metacarpal. Here, the tendon is split longitudinally into two. One slip is tunnelled dorsal to the M.C.P. joint to the region of the adductor pollicis insertion and the other slip to the E.P.L. tendon just proximal to the interphalangeal joint. With the wrist kept in about 30° flexion and thumb in maximum palmar abduction and pronation, the first slip is attached to the adductor pollicis insertion without tension but removing the slack. The second slip passing volar to the axis of the M.C.P. joint is attached to the E.P.L. tendon with tension adjustment of 2 to 4 mm pull on the slip before its attachment. Adjuvant procedures of claw hand correction, I.P. arthrodesis or thumb web plasty (Brand) wherever necessary was done as a routine.

RESULTS

The results of sublimis opponensplasty was graded as good, fair or poor, depending upon the amount of abduction, opposition, M.P. joint and I.P. joint status and the type of pinch. A result was considered a failure if the tendon transfer failed to improve appearance or function. The earlier method of assessing these parameters in the department were somewhat different from what the author currently adopts and considers to be a functional assessment (Table 2). The post-operative assessment done on the day, the patient is discharged from hand physiotherapy and occupational therapy treatment is the first assessment. In this study, this assessment showed that 109 (75.17%), hands had good results. (Table 3). There were six poor results and three failures. The results were not much different between the first follow-up assessment done six months

Table 2. Author's* criteria for assessing results in opponensplasty

	Good	Fair	Poor
I. Active abduction	>40°	20°-40°	<20°
II. Excursion of thumb	Full	At least to middle finger	Only to index
III. Pronation of thumb	To ulnar side of all fingers	Radial side of fingers	Nil
IV. M. C. P. Joint	30°-40° Flexion in pinch	40°-60° Flexion during pinch	Stiff or > 60°
I. P. Joint	0°-10° During pulp pinch	10°-45° During pulp pinch	Above 45° Flexion during pinch
V. Power of radial tripod or key pinch	40%-60% Of normal hand	<40%	Marginal increase or no difference

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Table 3. Results of sublimis opponensplasty in 145 hands

	Good	Fair	Poor	Failure
Post-operative assessment:	109 (75.1%)	27 (18.6%)	6 (4.14%)	3 (2.07%)
First follow-up: (between six months to one year after surgery)	103 (71.03%)	31 (21.37%)	6 (4.14%)	5 (3.45%)
Late follow-up: (periods after one year)	102 (70.34%)	30 (20.68%)	8 (5.52%)	5 (3.45%)

to one year after the operation and the late follow-up done after this period. There were 102 (70.34%) hands that had a good result in the late follow-up period (Fig. 1, 2 and 3). Complications of infection at the insertion sites, tendon tethering, inadequate tension were the factors that contributed to poor and failed results in the post-operative period. Whereas,

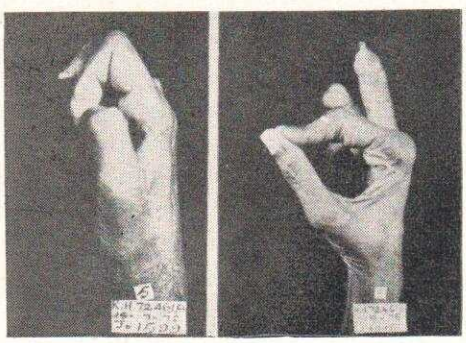

Fig. 1
Excellent result of sublimis opponensplasty after 3 years follow-up. Note good abduction and rotation with M.C.P. joint and I. P. joint stability.

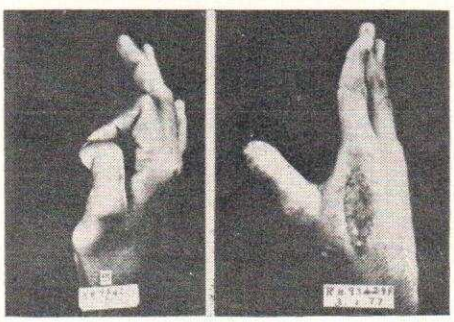

Fig. 2
Sublimis opponensplasty with Brand's thumb web release and skin grafting for opponens paralysis and thumb web contracture that never improved after adequate pre-operative hand physiotherapy.

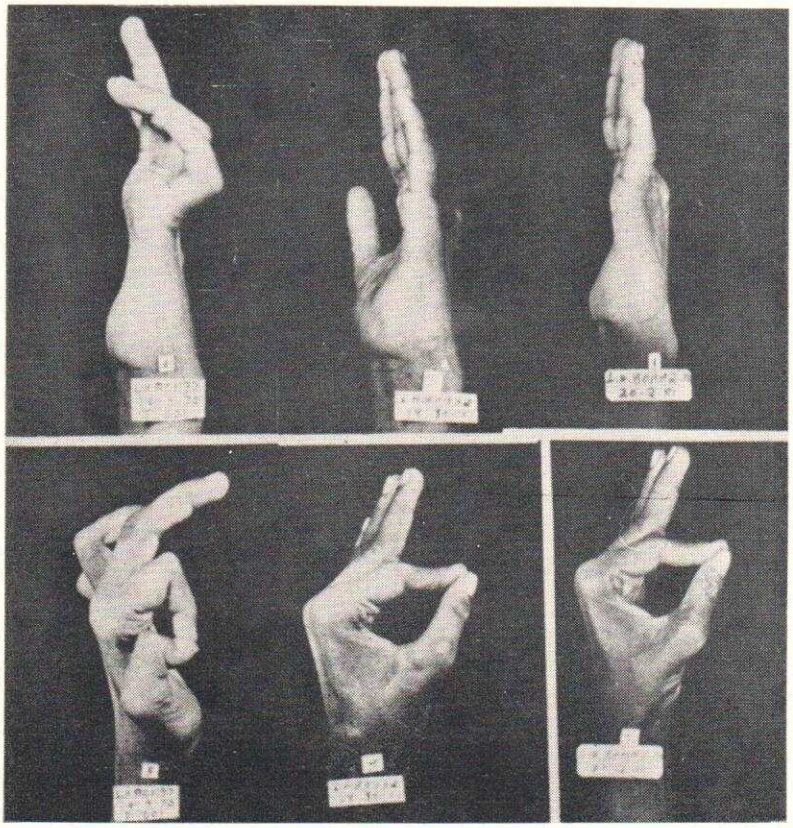

Fig. 3
Total claw hand deformity reconstruction. First column showing the claw fingers with loss of opposition of thumb. Second column showing results of sublimis opponensplasty combined with E. F. 4. T. Third column showing the same good results six years after surgery.

radial migration of the pulley, thumb web contracture not fully corrected earlier, M.C.P. joint instability and C.M.C. joint subluxation were the reasons for the poor results as seen in the late follow-up. No hand that was fair or poor showed any degree of improvement with time. No appreciable reduction in the length of the thumb, by way of absorption was seen in any of the hands with good results.

DISCUSSION

In the thumb more than the fingers, function involves an orchestration of motor and sensory activities. Absence or defect in any of the instruments of this orchestra produces an imbalance or discord in the rest of the hand. We are fully aware of the fact that both, motor and sensory functions are lacking in the hands of Hansen's Disease patients with neural damage. It is only a matter of time before a paralysed thumb develops thumb web contracture, I.P. joint contracture, C.M.C. joint subluxation or neuropathic change along with the risk of secondary deformities if the primary deformity remains unattended to. The average

duration of deformity preceding surgery in this study was 3.8 years, which is too long a period to remain with the paralysed thumb, unless some form of dynamic abduction splint is provided along with care of the anaesthetic thumb and working aids to help these patients pursue some activities of daily living. Moreover, it was surprising to note that 62 patients (42.75%) had over five years duration of deformity before surgery. This figure truly betrays the kind of inadequate survey and assessment that is being done at the field level. No problems arise from the attitude of patients to accept surgical rehabilitation once they are aware of it. We know that motivation is the keynote for success in total rehabilitation. The earlier surgical rehabilitation is instituted, the easier will be the patient's integration into the family and society, and brighter will be his chances of pursuing gainful employment.

The number of hands that had sublimis opponensplasty without adjuvant procedures was only nine. This number is too small to be subjected to statistical analysis for comparing the results on these hands with the results on the hands that had sublimis opponensplasty with claw finger correction. No difficulty was however found in the post-surgical care and re-education of the hands with claw finger correction and opposition correction. This combination of procedures has been done as a routine in this institution for many years. Of course a certain degree of competence and imaginative supervised hand physiotherapy are required.

The terminal inter-phalangeal joint flexion deformity was seen in 18% of the cases. It only changed a type of pinch pattern that was not desired i.e. tip pinch. These thumbs still had good abduction and opposition.

The long duration of Hansen's Disease with the possibility of disablement setting in at any time, makes it imperative for those engaged in surgical rehabilitation to provide reconstructive measures as early as possible to these patients. The sublimis opponensplasty (Brand's technique) is one of the important ancillaries to rehabilitate Hansen's Disease patients with median nerve paralysis.

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REFERENCES

1. **Brand, P. W.:** Tendon Grafting, J. Bone Joint Surg., 43-B : 444, 1961.
2. **Brand, P. W.:** Tendon Transfers of Median and Ulnar Nerve Paralysis, Orthop. Clin. N. Am., 1 : 447, 1970.
3. **Bunnell, S.:** Opposition of the thumb, J. Bone Joint Surg., 20 : 269, 1938.
4. **Riordan, D. G.:** Tendon Transplantation in Median and Ulnar Palsy, J. Bone Joint Surg., 35-A : 315, 1953.
5. **Thompson, T. C., Jacobs, B.:** Opposition of the thumb and its restoration, J. Bone Joint Surg., 42-A : 1015-1026, 1960.