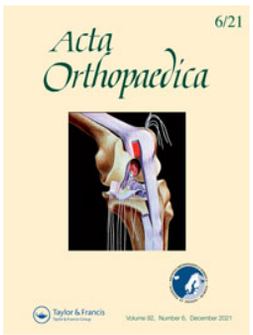

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Pectoralis minor transfer in serratus anterior paralysis

Six cases of serratus anterior paralysis were treated by transfer of the pectoralis minor muscle. The results were good in five cases.

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Isolated, complete paralysis of the serratus anterior muscle, appearing as a winged scapula, is rather rare. In most cases the long thoracic nerve supplying the muscle will recover spontaneously over a period of about a year. Therefore, therapy should be directed toward protecting the serratus anterior muscle from overstretching by means of a brace (Johnson & Kendall 1955).

If conservative treatment has been ineffective after about 2 years and the condition causes marked inconvenience, surgical treatment may be considered. The preferred procedure is transfer of the pectoralis minor from its coracoid insertion to the border of the scapula (Chaves 1951, Rapp 1954, Truchly 1981).

Patients and methods

I have performed a pectoralis minor transfer in six cases of serratus anterior paralysis. All the patients were female and aged 22–45 years at the time of the operation. In all cases the paralysis was on the right side. Trauma was the usual cause of the paralysis (Table 1).

The symptoms and signs were typical. No supporting splints or bandages had been used. The operative delay was 7 (2–12) years. At the time of surgery, all the patients were severely disabled due to pain on exertion and poor range of motion. The condition of the pectoralis minor muscle had been tested in planning the operation (Brunsström 1941).

The operation

The patient is positioned on the operating table on the unaffected side. Two incisions are necessary: one at the coracoid process and one in the axilla. The tendon of the pectoralis minor is isolated and detached from the coracoid process with a piece of bone. The upper part of the belly of the pectoralis minor is freed, preserving the nerve supply to the muscle. One or two holes are made through the lateral margin of the scapula into the lower third of it. The pectoralis minor muscle is tunnelled under the pectoralis major muscle to the axilla and tethered to the scapula by means of a six-to-eight-fold plantaris longus tendon graft. The muscle should not be overstretched, and passive movements of the arm should be unlimited after fastening the muscle to the scapula. Normally, a gap of a few centimetres remains and a free tendon graft is necessary.

After closure and dressing, the limb is immobilized in a Velpeau bandage. Mobilization is started by weight-free pendular motions of the shoulder 4 weeks after surgery. One to two weeks later, flexion and abduction exercises are started.

Table 1. Patients operated for serratus paralysis

Case no.	Age	Occupation	Etiology	Oper. delay in years	Follow-up in months
1	33	Office worker	Infection	10	18
2	37	Practical nurse	Depression of the shoulder	4	15
3	40	Bank clerk	Fall onto the shoulder	12	12
4	45	Chambermaid	Strong exertion	4	11
5	22	Factory worker	Fall onto the shoulder	7	11
6	44	Farmer's wife	Tractor accident	2	8

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Case reports

Case 1. A 22-year-old office worker had a prolonged wound infection following Caesarean section. Six weeks later, she had severe pain in the shoulder region, and shoulder motions deteriorated. The patient was able to perform her moderately light work, but after 10 years the pain in the shoulder region had increased and the shoulder motions deteriorated, so that the patient sought treatment once again. A winged scapula was demonstrated (Figure 1). A transfer of the pectoralis minor was performed close to the lower corner of the scapula, using six-fold plantaris longus tendon grafts for fixation. The upper extremity was immobilized using a Velpeau bandage for 4 weeks. After 4 months, the motions of the upper extremity were normal, there was good strength, the scapula was no longer winged and the patient was free of pain (Figure 2).

Case 2. A 33-year-old practical nurse incurred a distension of her right shoulder as she caught a patient who was falling out of bed. The shoulder was painful for 2 weeks, after which the scapula began to wing. She was unable to elevate the arm above the horizontal position. After 4 years the patient was unable to perform her job. A transfer of the pectoralis minor was performed. After 4 months, the shoulder motions were normal, the scapula was no longer winged, the patient was pain-free and she returned to work.

Results

Following the operation, the scapula was not winged in any of the patient. After 3 months, the motions of the shoulder were normal or almost normal in five patients. Four of the patients no longer had significant pain. Two patients still had pain primarily in the shoulder from an injury to the rotator cuff which had been diagnosed previously. In case 5 the scapula began to wing after a 2-week mobilization period. A paralysis of the pectoralis minor muscle was demonstrated by electroneuromyography. The transferred muscle in this well-built woman was branched and looked quite fragile. It was apparently unable to meet the demands of the transposition, which subsequently caused too much tension on its innervation. The patient's scapula is presently supported by a light splint with the intention of giving both the nerve and the muscle a chance to recover.

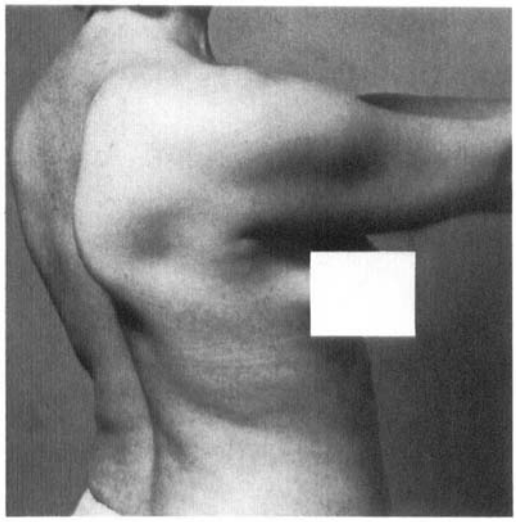

Figure 1. Winged scapula of a 33-year-old woman.

A transient complication of surgery in one patient was a peripheral weakness of the hand occurring over a 3-month period, apparently as a result of tension on the plexus during surgery. In two patients there were transient symptoms attributed to the short head of the biceps, the pain radiating to the biceps, perhaps as a result of the manipulation of the coracoid process.

Five of the six patients returned to work after about 4 months of sick leave.

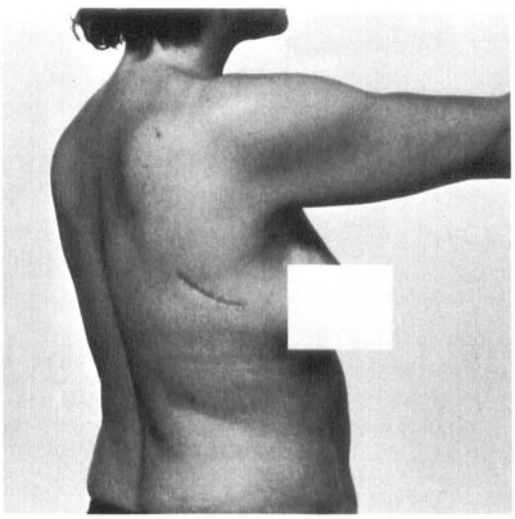

Figure 2. The same patient as in Figure 2, postoperatively.

Discussion

Paralysis of the serratus anterior muscle has been noted following a severe blow, fall, or sudden malforming twist and strain which forces the shoulder downward and backward, or after prolonged heavy weight bearing, strenuous games of tennis, or chronic strain of the neck and shoulder (Lindström & Danielsson 1962, Fardin et al. 1978, Stanish & Lamb 1978, Gregg et al. 1979, Kaplan 1980, Kaptelin & Pavlova 1980). In a number of cases the condition has developed after operative or obstetrical procedures, or after certain infections or viral diseases, or after the injection of sera, vaccines or antibiotics (Chaves 1951, Johnson & Kendall 1955). Wood & Frykman (1980) reported six injuries to the long thoracic nerve during first rib resection.

Various operations to correct paralysis of the serratus anterior muscle have been described (Campbell 1980). As early as 1904, Tubby described a procedure wherein the sternal portion of the pectoralis major muscle was used as the muscle transplant. Marmor & Bechtol (1963) also used this muscle. Herzmark (1951) used the rhomboids and Lindström & Danielsson (1962) and Zeier (1973) the teres major as a replacement transplant, with acceptable results.

Transfer of the pectoralis minor is beneficial in two ways: it will control scapular displacement directly by affording an adequate parallel substitute for the serratus anterior, and it will reduce the opposing action of the muscles attached to the coracoid process. The series of cases described here shows, however, that the operation may fail because of weakness of the transferred muscle. It is recommended that a splint is used to support the scapula in the early recovery stages.

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