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Congenital Absence of Pectoralis Major: A Case Report and Isokinetic Analysis of Shoulder Motion

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Although pectoralis major plays an important role as a prime or assistant mover for the varied range of shoulder movement, there was no significant functional loss in ordinary activities in case of congenital absence of this muscle, because of compensation of surrounding muscles. This report describes a 22-year-old soldier with unilateral congenital absence of pectoralis major, who had difficulties in specific upper extremity movement, such as throwing or climbing. There was no visible or radiological evidence of associated anomalies of ipsilateral upper extremity. Electrodiagnostic study showed normal findings except delayed latency of medial pectoral nerve supplying rudimentary pectoralis minor of the involved side. On isokinetic study of movement for both shoulders, peak torque and average power for horizontal adduction were markedly diminished on the involved side.

Key Words: Pectoralis major, isokinetic, shoulder

Among the muscles congenitally absent, pectoralis major is the most frequently involved (Kakulas and Adams 1985). Although pectoralis major is a large muscle and acts as a prime or assistant mover for all directions of shoulder movement except external rotation and horizontal abduction, there is no evidence of functional distrubances of this muscle, because of compensation of surrounding muscles (Hollinshed and Jenkins 1981). For this reason, the kinesiological significance of this muscle is nearly neglected when surgical procedure is applied to this muscle.

This report describes one case of congenital absence of pectoralis major without associated anomaly, who underwent cosmetic thoracic surgery to correct the depressed sternum.

Evaluation was based on physical findings, gross motor testing, X-ray and operative findings. Electrodiagnostic studies including nerve conduction study were performed to identify the integrity of peripheral nerves of upper extremity of the involved side.

Quantitative comparison of shoulder motion between normal and involved side was done, using isokinetic dynamometer.

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CASE REPORT

A 22-year-old soldier was referred to the Department of Rehabilitation Medicine with the complaint of asymmetrical configuration of chest wall. He had noticed since childhood that his right anterior chest wall was flat compared to that of left side. No specific diagnostic or therapeutic procedure had been done because there were no serious difficulties in ordinary activities. But in military camp he has had difficulties in performing certain training activities such as throwing a grenade and rope climbing.

His past and family history was not remarkable.

On physical examination, his right anterior chest wall was flat and right anterior axillary fold was absent. The anterior portion of the right deltoid muscle was hypertrophied. The sternum was mod-

Table 1. Results of isokinetic analysis for shoulder function

A) Flexion / Extension		Right	Left	Rt to Lt deficits
Peak torque at 60° /sec.	extension:	27ft-lbs (33°)*	34ft-lbs (48°)*	21%
	flexion :	27ft-lbs (126°)*	34ft-lbs (98°)*	21%
Peak torque at 180° /sec.	extension:	21ft-lbs (54°)*	20ft-lbs (54°)*	-4%
	flexion :	17ft-lbs(140°)*	22ft-lbs (98°)*	23%
Average power at 180± /sec	extension:	30 watt	34 wass	11%
	flexion :	34 watt	39 watt	13%
B) Abduction / Adduction		Right	Left	Rt to Lt deficits
Peak torque at 60° /sec.	abduction:	26ft-lbs (83°)*	32ft-lbs (17°)*	19%
	adduction:	25ft-lbs (81°)*	33ft-lbs (43°)*	24%
Peak torque at 180° /sec.	abduction:	18ft-lbs (60°)*	26ft-lbs (59°)*	31%
	adduction:	24ft-lbs (69°)*	29ft-lbs (69°)*	17%
Average power at 180° /sec	abduction:	27 watt	38 watt	28%
	adduction:	30 watt	49 watt	38%
C) Horizontal abduction / Horizontal adduction		Right	Left	Rt to Lt deficits
Peak torque at 60° /sec	H. abd.:	28ft-lbs (-13°)*	37ft-lbs (-28°)*	24%
	H. add.:	14ft-lbs (-86°)*	22ft-lbs (-89°)*	36%
Peak torque at 180° /sec	H. abd.:	18ft-lbs (- 8°)*	28ft-lbs (-17°)*	36%
	H. add.:	7ft-lbs (-40°)*	14ft-lbs (-53°)*	50%
Average power at 180° /sec	H. abd.:	51 watt	66 watt	22%
	H. add.:	4 watt	27 watt	85%

H. abd. = horizontal abduction
H. add. = horizontal adduction
Rt = right
Lt = left
* joint angle at which peak torque occurred.

erately depressed. There was neither visible anomaly for right upper extremity, nor significant differences in length and circumference between the two extremities.

Muscle strength in the right shoulder was good for flexion, adduction, horizontal adduction and internal rotation, and normal for other directions. He had full ROM of both upper extremities. Both pain and touch sensation were normal. The biceps and triceps tendon reflex were normoactive.

X-ray showed normal pictures of the bones of chest wall and upper extremities.

Electrodiagnostic studies including nerve conduction study, EMG and somatosensory evoked potentials for right upper extremity were essentially normal, and the latency for right pectoral nerve (to rudimentary pectoralis minor) was 8.8 msec. on Erb's point stimulation, which was moderately delayed compared to that of left side (2.8 msec.: Erb's point to pectoralis major).

In order to correct the sternal depression, a sternum turn over operation was performed. Surgery revealed that the right pectoralis major was totally absent and that the pectoralis minor was only rudimentary.

Using Cybex II Dynamometer and dual-channel

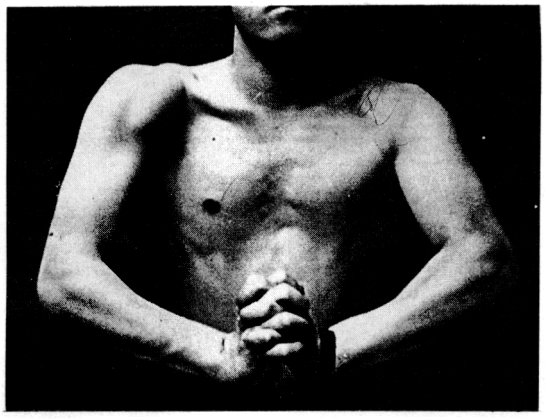

Fig. 1. Absence of right anterior axillary fold. Note hypertrophied anterior portion of right deltoid muscle.

strip chart recorder, the isokinetic test of both shoulders was done. The results are summarized in the table.

As seen in the table, the peak torque deficit and average power deficit between two extremities were greatest in horizontal adduction.

DISCUSSION

Bing(1902) reviewed 186 cases of congenital absence of muscles that had accumulated in the medical literature up to 1902. According to the review, the pectoralis muscles in 102 cases were deficient more frequently than any other muscles, followed by the trapezius absence in 18 cases.

In the case of congenital absence, or surgical removal of the pectoralis muscle during radical mastectomy, Flint *et al* (1970) found a surprising lack of functional disturbance in ordinary activities. They compared electrical activities of several muscles around the shoulder on the surgical side than on the nonsurgical side. The anterior deltoid recorded greater potential activity on the surgical side than on the nonsurgical side for flexion, adduction, horizontal adduction as well as extension from overhead. The biceps short head was more active during flexion, medial rotation and extension from overhead. The teres major and middle deltoid often played a compensatory role during various movements depending on the arm position.

Moreover, some authors suggest that the loss of the pectoralis major disables one much less than loss of the anterior deltoid, except in movements where great force is required (Rasch and Burke 1978). Actually, this patient had no specific diffeculties in ordinary activities, prior to attempting hard army training activities, such as throwing and rope climbing. His significantly hypertrophied anterior portion of deltoid verified the compensatory rloe for missing pectoral muscle.

Chand and Abdul Razif (1986) reported a case of abnormalities of nerve conduction and SEP in Poland's syndrome, which consist of congenital absence of pectoralis muscle and ipsilateral anomalies of upper extremity. While that case had definite anomalies of upper extremity, our case has no anomalies, and the nerve conduction study and a SEP for the upper extremity of the affected side showed normal findings. Only the conduction study for medial pectoral nerve to rudimentary pectoralis minor of the involved side revealed prolonged latency comparing the contralateral pectroal nerve to the pectoralis major at the same distance from the stimulation point.

In this case, the chest wall deformity may be caused secondarily by unbalanced muscular action due to the missing pectoralis major on the involved side. As a "weak point" costal cartilages can be elevated when the sternum is twisted by the strong force of the pectoralis muscles on the healthy side (Anderal and Kerschbaumer 1986).

It is thought that the pectoralis major acts as prime mover in flexion, extension, adduction and horizontal adduction with various muscles around the shoulder. Considering the data of isokinetic analysis of shoulder motion on our patient, the role of the pectoralis major in flexion, extension or adduction was not so significant. But in horizontal adduction, there was a marked peak torque deficit and an average power deficit. These findings are similar to that of a case with traumatic rupture of the same muscle (Kretzzler and Richardson 1989). This means that the pectoralis major plays a more important role in shoulder horizontal adduction than the deltoid. Considering the fact that this patient is right handed, the significance of this isokinetic data could be more emphatic.

In order to evaluate the exact role of the pectoralis major in shoulder function, a study of more cases of congenital as well as acquired absence of this muscle is necessary.

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