

Department of Orthopedic Surgery, Central Hospital, Västerås, Sweden.

A CASE OF AGENESIS AND A CASE OF RUPTURE OF THE PECTORALIS MAJOR MUSCLE

BRAGI GUDMUNDSSON

Accepted 15.ix.72

A G E N E S I S

Agenesis or hypoplasia of the pectoralis major muscle is rare. In such cases the sternocostal and abdominal parts are most often lacking. The cranial portion, pars clavicularis, is the first to develop in the foetus. Inhibition of further development explains the occasional lack of the two other parts. This muscular defect can be a singular malformation or can be combined with other malformations, both musculo-skeletal and cardio-pulmonal (Thorsrud 1968).

The clinical significance of this muscular defect, apart from the cosmetical aspect, is little.

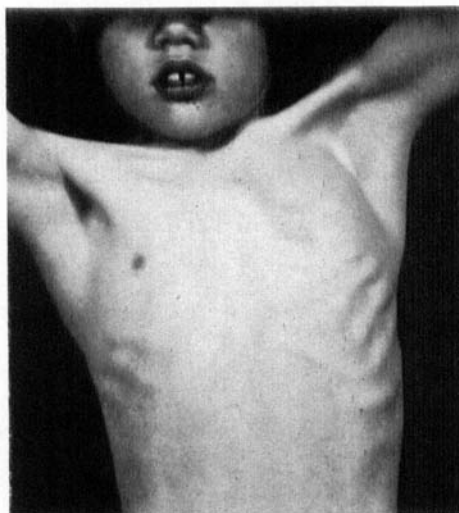
The role of the pectoralis major is primarily that of adduction and internal rotation. With the arm abducted the muscle fibres run obliquely and pull the arm forwards, as in swimming. When the arm is raised over the horizontal plane, all parts of the muscle exert the same effort of lowering the arm powerfully, as for example when striking with an axe. If both arms are fixed, shifting the punctum fixum and punctum mobile, the pectoralis major acts as an accessory breathing muscle.

Case Report

A six-year-old boy came to the clinic because of "flat feet". On examination the sterno-costal part of the pectoralis major muscle was found to be lacking on the left side. All other shoulder muscles were normal. The left mammilla was also lacking. An X-ray plate of the thorax showed flattening of the ventral aspect, rendering the sagittal diameter shorter on the affected side.

R U P T U R E

Few cases of rupture of the pectoralis major muscle have been recorded and all have occurred in well-trained athletes (Marmor et al. 1961).

*Figure 1.**Figure 2.*

Case Report

A 28-year-old wrestler complained of pain in his left shoulder after a match. He had been a wrestler for the previous 14 years. Four weeks before admission to hospital his left arm had been caught under the training mat and his body flung over to the opposite side by his companion.

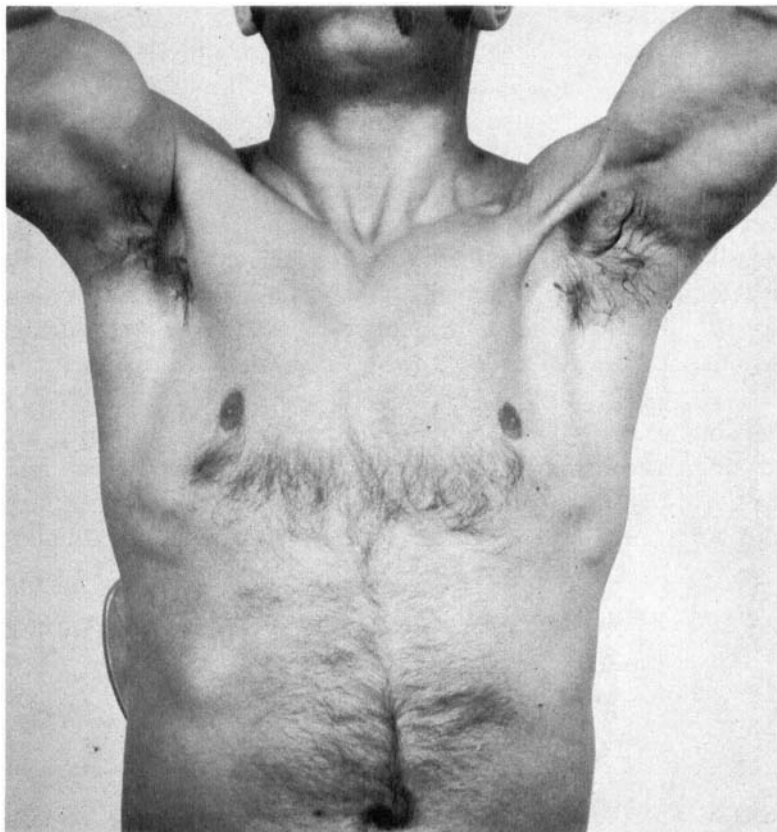


Figure 3.

On clinical examination he was found to have local tenderness over the belly of the left pectoralis major muscle and thinning of the axillary fold with widening of the axilla and weakness of shoulder function. Skeletal X-ray examination of the shoulder was normal and X-ray films of the "soft tissues" failed to show any changes in the pectoralis shadow.

Surgical repair was not tried in this case because it is said that operative treatment of this type of rupture does not give any considerable improvement, as in cases where avulsion of a bone fragment takes place (Marmor et al. 1961).

The wrestler took up training a few weeks after the injury. He experiences little difficulty in his daily work as construction worker but refrains from any wrestling matches.

DISCUSSION

It has been shown by McMaster (1953) that a normal tendon does not rupture and that the tendon can sustain considerable injury before it

breaks. Instead, either the tendon insertion or muscle origin gives way, often detaching a small fragment of bone, or the muscle belly ruptures or the musculo-tendinous junction separates. Numerous other clinical examples of the great tensile strength of tendons have been reported.

In accordance with the findings of Ralston et al. (1949), a muscle can sustain about four times as much weight as it can lift; that is: the maximum force of a muscle is a certain percentage of its isometric tension, illustrated by the formula $(P + a)(v + b) = \text{constant}$, where P represent load, v velocity, b is a constant having dimensions of velocity, and a the shortening heat per unit shortening, having the dimensions of force. This is shown in muscles having cineplastic tunnels.

According to the patient's history, the above case of rupture occurred when the arm was contracted with maximum force and the patient's body thrown during the wrestling. This represents an indirect type of trauma exerted along the entire musculo-tendinous unit

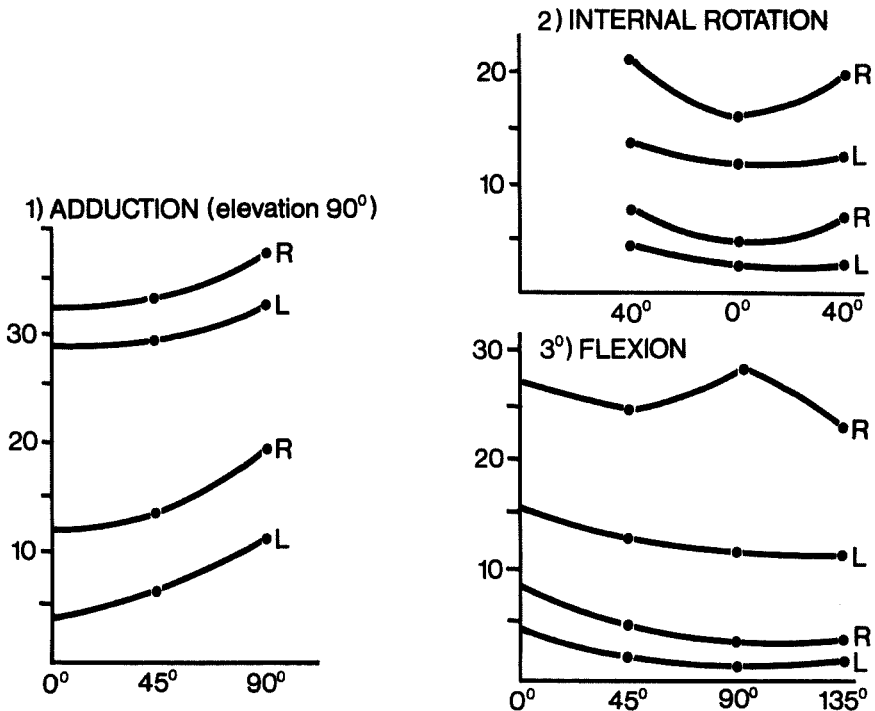


Figure 4. Graphs 1-3. Tension in pounds in isometric contractions at various angles. Higher values: case of rupture, lower values: agenesis.

from origin to insertion, causing the separation of the musculo-tendinous junction.

As it could be of interest to determine the loss of strength of those movements of the shoulder that required the sternal portion of the pectoralis major, the isometric contraction power in adduction, flexion and internal rotation was tested in both patients.

The graphs give very similar pictures of the difference in strength. As expected, the power is markedly decreased in flexion and internal rotation.

CONCLUSIONS

1. Full range of movements is possible in the shoulder without the pectoralis major muscle.
2. Marked decrease in flexion power and internal rotation power is seen in agenesis and after rupture of the pectoralis major muscle, limiting sporting activities and strenuous work.
3. A normal tendon does not rupture except at the musculo-tendinous junction or tendon insertion.
4. X-ray pictures of the chest in an individual with agenesis of the pectoralis major shows flattening of the ventral aspect.
5. The musculo-tendinous rupture should be allowed to heal by itself.

SUMMARY

Two pathological conditions of the pectoralis major muscle agenesis and rupture are presented. The tensile strength of tendons and the mechanism of rupture of the musculo-tendinous unit are described. Graphs showing the components of decreased muscle power have been drawn. The different aspects of treatment of rupture of the pectoralis major muscle are briefly discussed.

ACKNOWLEDGEMENT

I wish to express my thanks to Gösta Frykman, M.D., Associate Chief of the Orthopedic Surgical Dept., Västerås, for his valuable help and advice during the preparation of this paper.

REFERENCES

- McMaster, P. E. (1933) Tendon and muscle ruptures. *J. Bone Jt Surg.* **15**, 705-722.
 Marmor, L., Bechtol, C. O. & Cameron, B. H. (1961) *J. Bone Jt Surg.* **43-A**, 81-87.

Ralston, H. J., Pollissar, M. J., Inman, V. T., Close, J. R. & Feinstein, B. (1949) Dynamic features of human isolated voluntary muscle in isometric and free contractions. *J. appl. Physiol.* **1**, 526-533.

Thorsrud, G. K. (1968) Agenesis m. pectoral. major. *Nord. Med.* **18**, 960.

Correspondence to:

Bragi Gudmundsson

Dept. of Orthopaedic Surgery

Central Hospital

Västerås, Sweden