CASE REPORT

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Rectus Sternalis Muscle : A Debate For Anatomists, A Puzzle For Radiologists and Surgeons

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Abstract: Rectus Sternalis muscle is a rare anomaly of anterior chest wall that has debated origin, innervation and unknown function. In the present case it was bilaterally seen in an adult male cadaver. On right side it was unusually enlarged, distinct and strap-like measuring 15.5 cm in length and 2.4 cm at broadest part. Upper tendinous attachment was continuous with Sternocleidomastoid laterally and Sternohyoid medially. The lower attachment formed an aponeurosis that merged with that of External oblique. The nerve supply came from the medial and lateral pectoral nerves that supplied the muscle from deep aspect after piercing Pectoralis major. Left Sternalis was insignificant with a few fibers only. Lack of awareness of this variation has puzzled radiologists and surgeons in confirming diagnosis, missing it or mistaking it for a breast mass on mammography, CT or MR imaging.

Introduction

An unusual gross variation nurtures interest of anatomists and causes concern for clinicians when it mimics pathology. Sternalis muscle is a one such variation that challenges our understanding of anatomy of the parasternal region of anterior chest wall. The muscle may be seen unilaterally or bilaterally placed subcutaneously over Pectoralis major, extending parasternally from jugular notch to the costal region. It has been reported in either sex, in Asians and in whites as well as blacks[1,2,3,4]. Carbolis initially observed it but Du Puy first described it in 1726[5]. The incidence varies in different ethnic groups, ranging from 0.5% in Taiwanese[6] to 17.3% in Chinease[1]. Though noted over centuries, its origin, nerve supply and function are debatable. It is essential for the radiologists and surgeons to acknowledge this entity as it may pose a diagnostic dilemma mimicking a malignant breast mass on mammography, CT or MR imaging so that an exploratory surgery can be avoided[7,2].

Case Report

Rectus Sternalis muscle was seen bilaterally in a 40 year old male formalin-preserved cadaver, well defined on the right side, left being inconspicuous and represented by a few short fibers only (Fig.1).

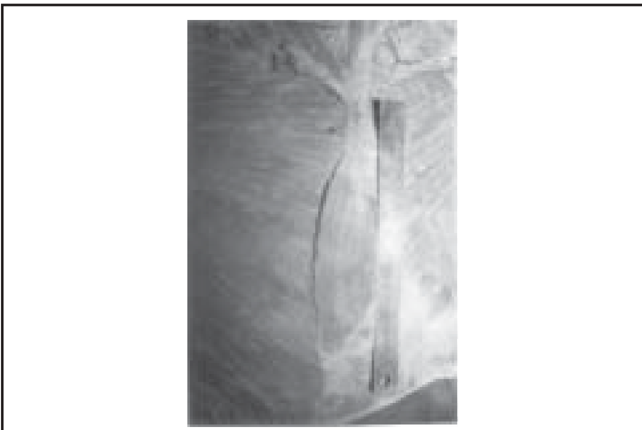

Fig.: Rectus sternalis (RSr) muscle is well developed on right side, only a few fibers seen on left side (RSl). On right side upper tendinous attachment is continuous with sternocleidomastoid (SCM) and sternohyoid (SH). Lower attachement is aponeurotic. Right Pectoralis major (PM).

Right Rectus Sternalis: Right Rectus Sternalis observed to be strap like, flattened anteroposteriorly, placed vertically parallel to the sternum, 15.5cm in length and 2.4cm wide at its broadest part. Though it was subcutaneous over the sternal attachment of Pectoralis major, a few muscle fibers also arose from sixth and seventh costal cartilages. The lateral border showed a lateral convexity, the medial was straight, placed besides the sternal margin. The upper fibers, attached to the anterior surface of manubrium converged into a tendon, that was in continuity with lower tendinous attachments of Sternocleidomastoid (sternal head) laterally and Sternohyoid medially. The lower fibers formed an aponeurosis, which was continuous with the aponeurosis of External oblique. At this end the length of muscle fibers increased from medial to lateal border giving the lower part of the muscle fancied resemblance to a sharp pointed kitchen knife, the tip being directed laterally and downwards. Nerve supply came from medial and lateral pectoral nerves, which supplied this muscle from deep surface after piercing Pectoralis major.

Left Rectus Sternalis : Left Rectus Sternalis was seen to be a thin band of fibers measuring only 3 cm in length and 0.6 cm at maximum breadth placed vertically over the sternal head of left Pectoralis major. The fibers were seen to be directed downwards and laterally, and intermingling with the fibers of underlying External intercostal muscle.

Discussion

Rectus sternalis muscle, a rare variant poses challenge to our understanding of anatomy of the paramedian region of anterior chest wall. It lies parallel to the sternal margin superficial to pectoral fascia, extending from infraclavicular region to costal margin and varies from a few short fibers to a well-developed strap like band of muscle. Kitamura et al[8] reported an isolated case of partial deficiency of Pectoralis major accompanied by an enormous Sternalis muscle.

Although noted in literature, dilemma persists about its origin and nerve supply. Bannister et al[9] view it as a misplaced fibers of Pectoralis major. However, embryologists[10,11] describe it as a part of ventral tip of hypomeres being represented by Rectus abdominis muscle in the abdominal region and by the infrahyoid musculature in the cervical region. In the thoracic region this layer usually disappears but occasionally persists as Sternalis muscle. O'Neill and Folan-Curran[12] highlighted differing views about origin of this muscle viz. Pectoralis major, Rectus abdominis, Sternomastoid or Panniculus carnosus. Most workers opined its derivation from Pectoralis major. Barlow[1] claimed it to be a remnant of Panniculus carnosus, a fact not accepted today. Kida et al[13] observed its nerve supply in 40 cases over 15 yeas and found pectoral nerves supplying it. Anterior branches of cutaneous intercostal nerves often penetrate the muscle to become cutaneous but do not supply Sternalis. In our finding the both medial and lateral pectoral nerves supplied Sternalis from deep surface after piercing and supplying Pectoralis major muscle.

In the light of various high-tech methods used in diagnosis and

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therapeutics it becomes imperative to note, record and discuss uncommon anatomical variants. Rectus sternalis muscle can easily be overlooked during breast surgeries and often be puzzling on mammography or CT Scan. This anomaly is highly unpopular among people in medical and surgical fields. A survey conducted among physicians, medical students, surgery and plastic residents and faculty from other disciplines revealed near-total unfamiliarity about this anomaly[14]. It is not due to its low incidence but may be due to paucity of encounter during surgery and imaging. With improved radiological imaging techniques Sternalis muscle will be noted more often than in yesteryears[2].

Diagnosing sternalis muscle on mammography can often be puzzling since it can mimic a malignant breast mass[7]. Bradley et al[2] gave the first description of this muscle in the breast imaging literature but could establish the fact only after open biopsy for a suspected breast tumor. Later they found 4 Sternalis muscles in 32,000 mammograms done over three yers. Bailey[14] noted this muscle in 3 patients undergoing mastectomy over a period of 15 years. The medial side of breast is considered as a potential blind spot on mammography in mediolateral projection. Radiologists must visualize this area in crainocaudal projection with adequate positioning and traction of breast to maximize volume of tissue and include mobile margins[2]. The diagnosis depends on its location, orientation and absence of corresponding abnormality on lateral views[2]. For better visualization CT scan should be done as it clearly defines longitudinal and parasternal course of the muscle.

Thus, we conclude that rectus sternalis muscle can be a puzzle for anatomists, a diagnostic dilemma for radiologists or surgeons who must have the knowledge of this uncommon variant in the anterior thoracic wall otherwise it could be easily misinterpreted during mammography, imaging by computed tomography or magnetic resonance.

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Literature Review

Compiled by Dr. P. Chattrree

Azithromycin combination therapy with artesunate or quinine for the treatment of uncomplicated falciparum malaria in adults. Noedl H, K nirseh C et al. *Infection 2005;33:170.*

Azithromycin may have an impartant role as an antimalarial due to its safety in children and experience with use in pregnancy. The study was designed as a phase II open label, randomized 28 day inpatient study of acute, uncomplicated falciparum malaria, comparing the safety and efficacy of azithromycin (AZ) - artesunate (AS) combination with AZ-quinine (QN) regimens in 1000 adults patients : (1) 3 days of AZ 750 BID & AS 100mg BID. (2) 3d of AZ 1000 OD & AS 200OD (3) 3d of AZ 750mg BID & QN 10mg / 1kg BID, (4) 3d of AZ 500mg TID daily & QN 10mg 1kg TID.

After completion of the first 50 subject failure rates, PCT & FCT were compared in a preliminary efficacy analysis. The 28 day cure rates for the 4 groups were 100 (95% cl; 71-100), 100 (73.5-100), 72.7 (39.0, 94.0), and 91.7 (61.5 - 99.8) respectively. Two RIIIs and one RI failure were seen in the BID quinine axm. With a mean PCT & FCT of 34 ± 12 and 26 ± 18 hours the artesunate combinations led to a significantly ($P<0.001$) faster clinical and parasitological improvement than the quinine arms (80 ± 34) and 60 ± 39 hours) Clinical treatment response was closely correlated with in vitro drug sensitivity data. Drug combination were generally well toterated. These data suggest that both azithromycin-artesunate even when given only once daily for 3 days as well as azithromycin-quinine TDS are safe and highly efficacious combinations for uncomplicated falciparium malaria.

Angiotensin receptor blockers and ACE inhibitors are equivalent in type 2 diabetic nephropathy. Bamett AH, Bain SC, Bouter P et al. *N.Engl. J.Med 2004;351(19)1952-1961.*

In this prospective multicenter, double blind 5 years study. 250 subjects with type II diabetes and early nephropathy were randomly assigned to receive either the angiotansin II receptor blocker telmisartoin (80mg daily in 120 subjects) or the ACE inhibitor enalapsil (20mg daily in 130 subjects). The primary endpoint was the change in glomerular filteration rate (determined by measuring the plasma clearance of ionexal) between the baseline value and the last available value during the 5 year treatment period. Secondary end points included the annual changes in the GFR, serum creatinne level, urinary albumin excretion, and blood pressure, the rate of end stage renal disease and cardiovascular events and the rate of death from all causes.

After 5 years, the change in glomerular filteration rate was -17.9 ml/min/1.73m^2 of body surface area; with telmisartan (in 103 subjects) as compared with 14.9ml/min 1.73m^2 with enalapril (in 113 subjects), for a treatment difference of -3.0ml/min/1.73m^2. The lower boundary of the confidence interval in favour of enalapril was greater than the predefined margin of -10ml/min/1.73m^2, indicating that telmisartan was not inferior to enalapril. The effects of the two agents on the secondary end points were not significantly different after 5 years.