

Clinical Implications caused by the agenesia of the Rectus Abdominal Muscle's (MRA) inferior venter

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Abstract

The rectus abdominal muscle is part of the anterior abdominal wall, having three to six bellies. In only one of the 106 dissections already made in the “Faculdade de Ciências Médicas de Minas Gerais” Anatomy Laboratory was found a male cadaver who did not have inferior venter of this muscle bilaterally. Instead, at the left side, was found a tendon that measured 5.5 cm laterally and 12 cm medially, and at the right side, there was the same variation with a 15.5 cm length tendon, rising in the upper branch of the pubis and crest pubis. Despite being a rare variation, individuals who have showed it have increased potential for physiological and surgical complications, in case they need interventions using inferior rectus abdominis muscle venter's snips.

Keywords: rectus abdominal muscle, anatomic variations, inferior venter.

1 Introduction

The rectus abdominal muscle (MRA), with the pyramidal muscle, forms the anterior abdominal wall (TESTUT, 1986). This muscle performs a lot of physiological functions and utilities in the medical practice: postural static; protection of the anterior abdominal wall against the formation of hernias and impacts; rise of the intra-abdominal pressure, helping the defecation, urination, expiration, expulsion of the concept, flexion of the trunk when the hips are fixed, flexion of the hips when the trunk is fixed (ROY, KELLER and COLLOCA, 2003). It can be used to make free morsels in the urgency treatments of complex member traumatism (LAZO, ZATIT, COLICCHIO et al., 2005), correction of the iatrogenic defects of the diaphragm (FARIA, PIPPI, OLIVEIRA et al., 2000), mammary reconstruction with transverse morsels of skin and muscle (GOMES and PESSOA, 2010) inguinal reconstruction with vertical skin and muscle's morsels in the treatment of squamous penile carcinoma with metastasis in the inguinal lymph-nodes (MOURA, BEZERRA and OLIVEIRA, 2010). Then, the knowledge of the anatomy and physiology of the MRA is very important to identify abnormalities of its morphology and function and recognize the capacity of its utilization in the treatment of lots of affections and lesions.

The MRA is divided transversally in four muscle bellies in its structure by aponeurotic intersections, whose unique constant characteristic is its variability. In the white-skinning people it can be found two (3%), three (38%), four (57%) and even five (10%) aponeurotic intersections (TESTUT, 1986) and, consequently, three, four, five or six muscular venter. During the dissections of 106 cadavers (101 of the male sex and 5 of the female sex) between the years of 1992 and 2011 in the Anatomy laboratory of the “Faculdade de Ciências Médicas de Minas Gerais”, we've found a male cadaver with the rectus abdominal muscles of both sides of the abdomen with three aponeurotic intersections and four venter, bilateral reduction of the inferior venter and, being the right muscle

smaller and with its substitution by aponeurotic tendons with an extension bigger than the habitual.

The agenesia of the inferior venter of the rectus abdominal muscle is an uncommon anatomic variation, that is described in the literature only by Matteucci, Stanley, Bates et al. (2009). This anatomic variation was found by the authors during a surgery of mammary reconstruction in that they were going to use a morsel of perforating inferior epigastric artery. They had to change the morsel by a skin and muscle morsel during the surgery because of the anatomic variation (MATTEUCCI, STANLEY BATES et al., 2009).

This anatomic variation can also rise the incidence of abdominal hernias because the weakness in the inferior part of the abdominal wall, chronic back pain, once the postural static can be committed, rising the compressive strange on the intervertebral discus (ROY, KELLER and COLLOCA, 2003).

2 Materials and Methods

There were dissected 106 cadavers (101 of the male sex and 5 of the female sex) between the period of 1992 and 2011 in the Anatomy Laboratory of the “Faculdade de Ciências Médicas de Minas Gerais”. The methods of dissection utilized were described by the “Manual of Human Dissection of Shearer” (WEBER, 2001).

The cadavers were oriented in dorsal horizontal decubitus and the skin and the subcutaneous tissue were removed of the anterior-lateral faces of the thorax and abdomen. Then, it was made the resection of the fascia of the muscles rectus abdominal and external obliques, identifying their muscular bellies, the anterior laminae of the scabbard and the line Alba, since the xiphoid process even the pubic symphysis.

The longitudinal incision in the anterior lamina of the rectus abdominal scabbard was done, between the line Alba and the line semilunar. The lateral and medial parts were

repelled in both sides, separating the tendinous intersections of both of the rectus abdominal muscles of their insertions on the posterior part of the rectus scabbard. Finally were dissected the vessels and nerves medially situated to the line semilunar and were made the section of the vessels, nerves and links between the medial borders of the muscular bellies of the rectus abdominis muscles and the line Alba. After it, the rectus abdominal muscles were liberated of their weak links with the anterior part of the scabbards being, like that, discharged anterior and posterior being fixed only for their costal origins (5th, 6th and 7th) and by their insertions on the pubis bilaterally.

3 Results

In our dissections, it was found a male cadaver with the following anatomic variation: its rectus abdominal muscles weren't symmetric bilaterally. The right muscle had a tendon of 15,5 cm of length, and it was substituting the inferior venter, originating in the superior branch of the pubis and the pubic crista. The left muscle also had a tendon in the place of the inferior venter and its size was variable. It had 5.5 cm of length and 12 cm of breadth (Figure 1).

It wasn't found in the cadaver a scar that explains that the cadaver was submitted to a surgery before. Then, an iatrogenic atrophy by the lesion of the innervation or vascularization of the rectus abdominal can't be the responsible by our finds.

The first nerve that penetrates the rectus abdominal, from down to up was 0.5 cm after the final of the tendon of the right side and 4.5 after the final of the tendon in the left side. This fact goes to find to what was purposed by LLorca (1963), in that both of the tendons were formed possible by the atrophy of the muscles because of their poor innervation (LLORCA, 1936).

The variation described in our achievement has a big importance because the big frequency that the rectus abdominal muscle is utilized in operations and the chance of complications (necrosis by the poor sanguine supply) with the confection of a morsel in a patient with this variation certainly is raised.

4 Discussion

The study of the anatomy of the rectus abdominal muscle has assumed a particular importance. Lots of surgical techniques were developed based on the knowledge of its anatomy causing the advance principally of the modalities that have the reconstruction like an objective (LAZO, ZATIT, COLICCHIO et al., 2005; GOMES and PESSOA, 2010; MOURA, BEZERRA and OLIVEIRA, 2010). The mammary reconstruction utilizing the skin and muscle transverse morsel of the rectus abdominal muscle has been the most utilized procedure between the ones that utilize autologous tissues (GOMES and PESSOA, 2010). In the plastic surgeries that aim the reconstruction post-trauma of the members, the morsel that has been the champion in indications is the one of rectus abdominal (24%), and the radial antibrachial is in the second place (17%) (LAZO, ZATIT, COLICCHIO et al., 2005; KHOURI, COOLEY, KUNSELMAN et al., 1998).

In the case of patients who have squamous carcinoma of penis with the evidence of metastasis in inguinal lymph nodes, during the resection of these lymph nodes there is a big loose of substance in the inguinal region, with the exposition of noble structures, becoming the primary closure one impossibility, the skin and muscle vertical morsel of the rectus abdominal muscle comes like one alternative, having satisfactory results (MOURA, BEZERRA, OLIVEIRA et al., 2010).



Figure 1. The Picture shows the three superior venters of the rectus abdominal muscle and the inferior venter is substituted by a tendon.

Lots of studious people have been dedicated to study and describe the anatomy of the Rectus Abdominal Muscle. It's described like a poligastrics muscle, presenting variations in the quantity of its muscular bellies, being the common the presence of 3 tendinous intersections (58%), and four intersections is the second most common found (35%) (SKANDALAKIS, SKANDALAKIS and SKANDALAKIS, 2004; MILLOY, ANSON and McAFFEE, 1960). The fourth intersection is always below the umbilical scar.

Many authors purposed over time various explanations in respect of how the intersections were formed, not existing a consensus about the issue. Some affirm that the intersections are derivate of the embryologic segmentation that formed the muscle (SKANDALAKIS, SKANDALAKIS and SKANDALAKIS, 2004; LLORCA, 1963). Llorca, in 1963 had an interesting explanation. Second him, the nervous filets penetrate the muscle in a horizontal position and in the places where we don't find much innervation, the contraptions is done in a lower way. In consequence, this part is atrophied and generate secondarily a fibrous portion, creating the tendinous intersection (MILLOY, ANSON and McAFFEE, 1960).

There are many discussions in the literature about the question if the muscular fibers are continuous or not. Some authors affirm that the tendinous intersections are incomplete, doing a trajectory always angulated and many times not presenting like a complete division, and many fibers can be continuous in two or more muscular bellies, even other fibers have just the length of one muscular belly (GARDNER and OSBURN, 1974; DELP, SURYANARAYANAN, MURRAY et al., 2001). Actual studies demonstrate that the length of the fibers is of 34,3 cm ($\pm 2,7$ cm), in the muscle tendinous length ($35,9 \pm 1,9$ cm), and in the length of the fascicule ($28,3 \pm 3,6$ cm) showing that the fiber would be long and cross all muscle. However, other authors still are of the opinion that the fibers of the rectus abdominal muscle are interrupted of the section to section by aponeurotic intersections, and its fibers wouldn't be continuous (HOLLINSHEAD, 1980; WOODBURNE and BURKEL, 1994).

5 Conclusion

Beside of being an anatomic variation of low frequency, this one has a big importance because of the functions that the Rectus Abdominal Muscle performs and the possibilities of use of the inferior venter in surgical procedures. The patient who has this anatomic variation is suggested to physiologic complications during its life and, in case to be necessary one surgical intervention that utilize a morsel of the muscle, the surgical technique must be modified to bypass this obstacle and perform the surgery with success. In this case, this variation must be always considerate and the surgeon already has to have an alternative before the procedure, beyond to prepare for bigger surgical complications.

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