



Unilateral partial absence of rectus abdominis muscle

Published online February 7th, 2017 © <http://www.ijav.org>

Sumathi SHANMUGAM +
Sivakami THIAGARAJAN
Gayathri JAYAMURUGAVEL

Department of Anatomy, Thanjavur Medical College,
Thanjavur, INDIA.



+ Dr. Sumathi Shanmugam, MS
Department of Anatomy
Thanjavur Medical College
59, First Street
North Natarajapuram
Thanjavur-613004, INDIA.
☎ +91 (948) 7540989
✉ tnj_muthu@yahoo.com

Received June 25th, 2016; accepted December 30th, 2016

Abstract

The rectus abdominis is a strap muscle situated in the anterior abdominal wall on either side of the midline. Complete or partial absence or alterations of anterior abdominal wall muscles is rare and occurs in 7% of individuals. The absence of abdominal muscles associated with genitourinary abnormalities is described as prune belly syndrome. In prune belly variant, there are defects only in the abdominal wall muscles without associated urological defects. However, the rectus muscle is not involved in it. Isolated complete or partial absence of rectus abdominis is rare. We report here a case where the rectus abdominis of right side was aponeurotic in the supraumbilical part. The length of the aponeurotic part was 9.5 cm and the breadth was 4 cm. The rectus abdominis of left side and other anterior abdominal muscles were normal. The complete absence of abdominal muscles occurs if there is damage before six weeks of development. The hypoplasia of muscle presenting as localized fibrous defects is more suggestive of vascular compromise. This variation is significant in the light of the rectus abdominis muscle being used in various surgical reconstruction techniques.

© *Int J Anat Var (IJAV)*. 2016; 9: 88–90.

Key words [rectus abdominis] [absence] [isolated]

Introduction

The rectus abdominis (RA) is a strap muscle situated in the anterior abdominal wall on either side of the midline. It extends along the entire length of the anterior abdominal wall. It has two heads of origin; the larger lateral head arises from the pubic crest and the smaller medial head from the front of pubic symphysis. The muscle is inserted by four slips into the xiphoid process, 5th, 6th and 7th costal cartilages. Three to four tendinous intersections from the anterior lamina of the rectus sheath cut through the anterior part of the muscle [1]. Complete or partial absence or alterations of anterior abdominal wall muscles is very rare and its reported to occur in 7% of individuals [2]. The abdominal muscle that is absent frequently is transversus abdominis; then in order are the Internal oblique abdominis and external oblique abdominis [3].

An abdominal wall defect when associated with urological anomalies presents as prune belly syndrome. In prune belly variant, there are defects only in the abdominal wall muscles without associated urological defects. However, the rectus muscle is not involved in it. Isolated complete or partial absence of RA is rare [4]. The deficiency in supraumbilical part of RA is very rare and occurs in patches [3]. We report here

such a case of unilateral isolated partial absence of RA and its relevance to various reconstructive surgical procedures.

Case Report

During routine dissection of a male cadaver aged 75 years, the RA was not bilaterally symmetrical. On both sides, there were three tendinous intersections: one at the level of umbilicus, one at the level of xiphoid process and the third was situated between these two. The fleshy muscle fibers of RA of right side was replaced by aponeurosis in the supraumbilical part between the lower two intersections. The length of the aponeurotic part was 9.5 cm and the breadth was 4 cm (Figure 1a). The RA of left side was normal. Other anterior abdominal muscles were normal. The superior epigastric artery ran downwards on the posterior surface of the aponeurosis (Figure 1b). There were no trace of scars or adhesions indicative of previous surgery. There were no genitourinary malformations. The microscopic appearance of the aponeurotic part of the muscle with hematoxylin and eosin stain under 10x and 40x magnifications revealed atrophic skeletal muscle fibers admixed with extensive fibroblast and collagen (Figures 2a, 2b).

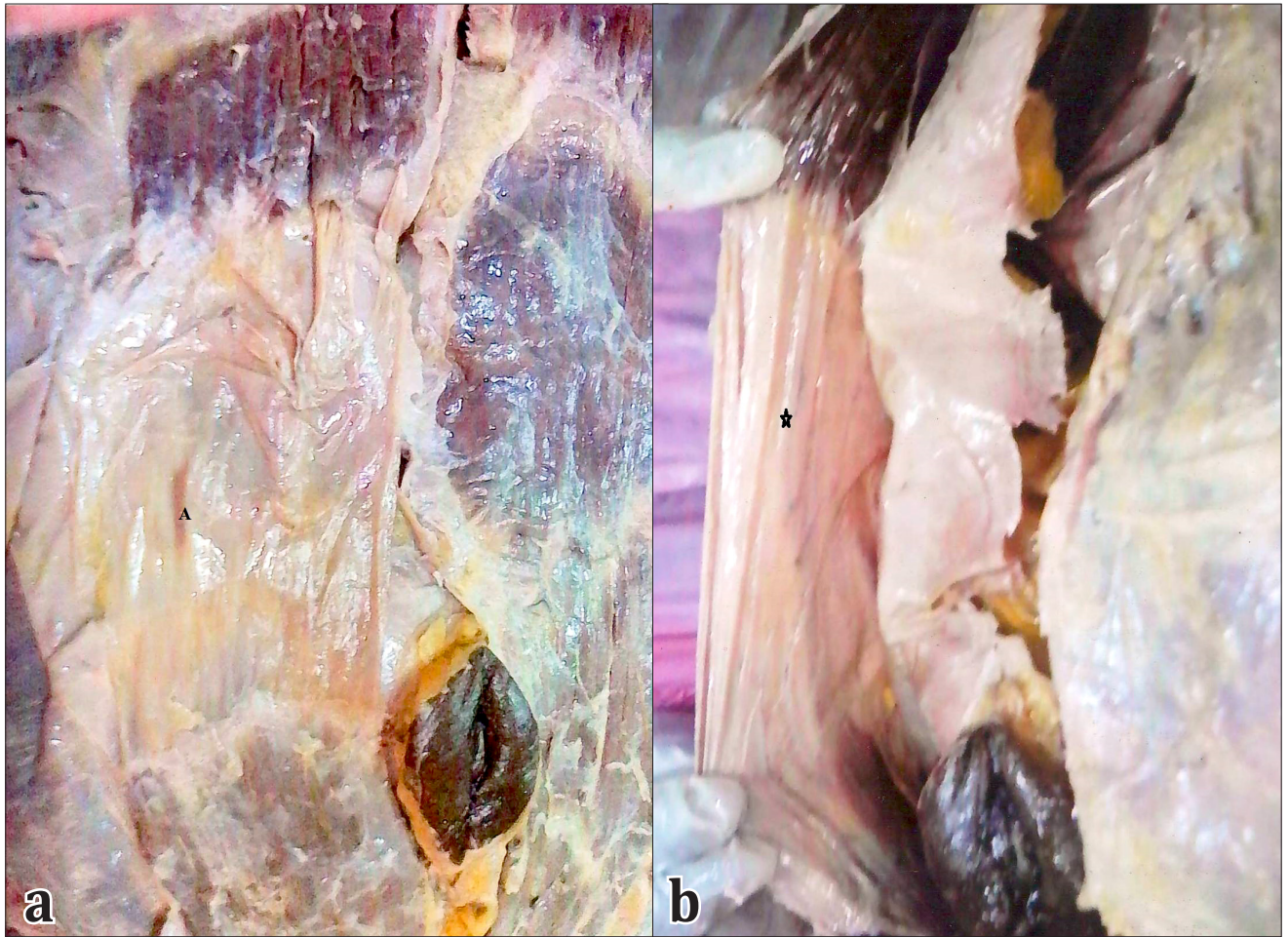


Figure 1. **a)** Picture shows the aponeurotic part of rectus abdominis on the right side. **b)** Picture shows the superior epigastric artery running on the posterior aspect of aponeurotic part of rectus abdominis (*).

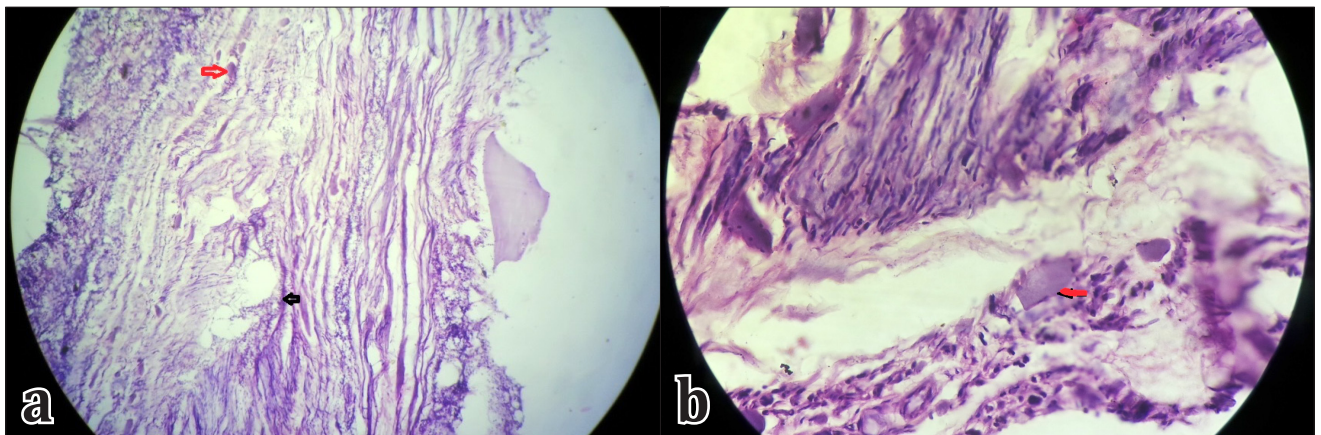


Figure 2. **a)** Hematoxylin and eosin stain showing few atrophic skeletal muscle fibers (**red arrow**) admixed with extensive fibroblast and collagen fibers (**black arrow**) 10x. **b)** 40x view showing the atrophic skeletal muscle fibers (**black arrow**).

Discussion

The musculoskeletal system of the trunk develops from the paraxial and lateral plate mesoderm. Segmental somites derived from the paraxial mesoderm organize to form the dorsolateral dermomyotome and the ventromedial sclerotome. The musculature of the anterior abdominal wall is derived from the myoblasts of segmental hypomere that differentiates from the myotome [5]. During development of anterior abdominal wall muscles, two plate-like mesenchymal condensations corresponding to undifferentiated RA and lateral abdominal muscles appear at five weeks. The segmental myoblasts of RA starts to differentiate at about six weeks from above the umbilicus and extends inferiorly. The abdominal wall muscles can be differentiated at this stage. At seven weeks, the supracostal part of RA is consistently present. The RA muscle is absent or very thin below the level of umbilicus until eight weeks. The sub umbilical increase in width and thickness occurs at nine weeks and becomes enclosed within the rectus sheath [6].

If the abdominal muscles are completely absent then the cause for it must have occurred before six weeks of gestation. The hypoplasia of muscle presenting as localized or patchy defects with dense fibrous tissue is suggestive of vascular compromise [3]. Llorca has stated that if nerve fibers which innervate the segmental muscles are absent then that part of the muscle is atrophied and replaced by a fibrous portion [7].

Gerard-Blanluet et al. have reported two patients with unilateral abdominal wall musculature deficiency and they have attributed this type of partial deficiency of RA to a localized defect in the development of somatic mesodermal mesenchyme during early embryogenesis [8]. Ger and Coryllos have reported a case of absence of anterior abdominal wall

musculature with associated genitourinary anomalies. They suggest that early mesodermal defect of first lumbar segment frequently resulted in absence of the upper part of RA [9]. The unilateral supraumbilical deficiency of RA and its replacement with aponeurosis in the present case is more suggestive of a localized vascular deficiency that has resulted in fibrosis of muscle tissue.

This variation is significant in the light of the RA muscle being used in various surgical reconstruction techniques. The transverse RA musculocutaneous flap first described by Hartramp and Gandolfo in 1982 has now become an important reconstructive structure particularly with regard to reconstruction of breast following mastectomy. Next are the post traumatic reconstructions like augmentation of tissue loss on anterior thorax where the RA muscle is used in about 24% of surgeries [1]. The lower half of the RA is used for reconstruction after radical pelvic and perineal resections. Other procedures for which RA is used are correction of iatrogenic defects of diaphragm and inguinal reconstructions. Pedicle RA flap is used to treat complicated stress urinary incontinence and in reconstructive surgeries for chronic facial nerve palsy [10]. Bitto et al. have stated that pectoralis major and RA have the potential to be used as a replacement for diseased myocardium and as an outflow patch for hypoplastic ventricle [11].

The functional significance of the RA and its increasing usage in surgical procedures makes it necessary to be aware of the variations in the morphology of RA. RA flap has started becoming indispensable with so many reconstructive procedures using it, that knowledge about its variations becomes essential to plan an alternative procedure.

References

- [1] Williams PL, Bannister LH, Berry MM, Dyson M, Dussek JE, Ferguson MW, eds. *Gray's Anatomy*. 39th Ed., Edinburgh, Churchill Livingstone. 2005;1105.
- [2] Holterman MJ, Grevious MA, Fritz JP Jr, Bolender DL. *Trunk Embryology*. <http://emedicine.medscape.com/article/1297184-overview> (accessed February 2015).
- [3] Yang JD, Hwang HP, Kim JH, Rodríguez-Vázquez JF, Abe S, Murakami G, Cho BH. Development of the rectus abdominis and its sheath in the human foetus. *Yonsei Med J*. 2012; 53(5): 1028-1035.
- [4] Gray SW, Skandalakis JE. *Embryology for surgeons*. Philadelphia, W.B. Saunders. 1972; 433-436.
- [5] Moore KL, Persaud TVN. *The developing human, clinically oriented embryology*, 7th Ed., Philadelphia, W.B. Saunders. 2003; 405-406.
- [6] Hall JG. Isolated deficiency of abdominal muscles. In: Stevenson RE, Hall JG, eds. *Human malformations and related anomalies*. 2nd Ed., New York, Oxford University Press. 2006; 799.
- [7] Ribeiro DMC, Cerqueira PC, Silveira D, Lana Siqueira SL, Sales MC, Soares GR, Martins LAG, Franco AG, Gama HVP, Casagrande MM. Clinical implications caused by the agenesis of the rectus abdominal muscle's (MRA) inferior venter. *J Morphol Sci*. 2013; 30(2):91-93.
- [8] Gerald-Blanluet M, Port-Lis M, Baumann C, Perrin-Sabourin L, Ebrad P, Audry G, Delezoide AL, Verloes A. Unilateral agenesis of the anterior abdominal wall musculature: An early muscle deficiency. *Am J Med Genet A*. 2010; 152(11):2870-2874.
- [9] Ger R, Coryllos EV. Management of the abdominal wall defect in the prune belly syndrome by muscle transposition: an 18-year follow-up. *Clin Anat*. 2000; 13: 341-346.
- [10] Aktan Ikiz ZA, Ucerler H. Bilateral absence of the tendinous intersections of the rectus abdominis muscle. *Anatomy*. 2009; 3: 69-71.
- [11] Bitto T, Mannion JD, Hammond R, Macoviak JA, Rashkind WJ, Edmunds LH, Stephenson LW. Pectoralis major and rectus abdominus muscles for potential correction of congenital heart defects. In: Doyle EF, Engle MA, Gersony WM, Rashkind WJ, Talner NS, Eds. *Pediatric Cardiology, Proceedings of the Second World Congress*. New York, Springer-Verlag. 1986; 609-612.

