

## Variations and Incidence of Agenesis of the Pyramidalis Muscles in Nigerian Males

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### ABSTRACT

In recognition of the variations in occurrence, shape and size of the pyramidalis muscle in different races, sexes and nationals and its relevance in flap and graft, this study was carried out to determine the incidence of its agenesis, variation in occurrence, shape and mean values of length and breadth in Nigerian males. A total of 24 male cadavers from the Anatomy Laboratories of different Nigerian Universities were used in this study. Dissection of the lower anterolateral abdominal wall was made to ascertain the presence, shape and size of the muscle. Agenesis occurred in 8.33% of the subjects studied. There was no case of unilateral occurrence or supernumerary presence and the predominant shape was triangular with no difference in shape on either side. The mean values of the length and the breadth for the right pyramidalis muscle were 8.09 0.70 and 1.55 0.28, while the mean values of 7.94 1.71 and 1.6 0.30 were recorded for the left. These differences were found not to be statistically significant ( $P > 0.05$ ). Our findings suggest that the incidence of agenesis of the pyramidalis muscle in Nigerian males is not common and there are no significant differences in the sizes of the muscle on either size

**Key words:** Pyramidalis muscle, Variations, Incidence

The pyramidalis muscle has been traditionally described as a small triangular muscle that lies in front of the inner part of the rectus abdominis within the rectus sheath (Moore 1999, Williams et al 1999, Last 1999). It is attached by tendinous fibres in front of the pubic symphysis. The muscle diminishes in size as it passes upward where it attaches to the linea alba between the pubic symphysis and umbilicus.

Although reports of the investigation on the pyramidalis muscle could be traced to the early 18<sup>th</sup> century (Hallet 1848), this structure has continued to attract the attention of anatomist on account of its variations in shape, size, occurrence in various races, nationals, and sexes (Anson and Beaton 1939). Studies on Asians subjects showed that the percentage is considerably lower when compared to Caucasians and negroes (Nakamura 1935, Wagenseil 1927). Contrary to early suggestions that the muscle is well developed in monotremes and marsupials and only exists as an atrophic remnant in man (Testut 1884 Ledouble 1897, Wiedersheim, 1907), it is now widely accepted to be more developed in man (Vallois 1926, Loth 1912).

The muscle is supplied by the subcostal nerve but variations in innervation has been reported (Tokita 2003)

The pyramidalis muscle is a tensor of the linea alba, however this function is not indispensable, as a recent report indicates its usefulness as a free flap muscle for the treatment of recalcitrant wound in ankle and foot region (Landyut 2003). Parent (1973) and de Leval *et al* (1984) also mention its use in the MarshallMarchetti operation for urinary incontinence

In view of the paucity of information on the incidence and variations of the pyramidalis muscle in Nigerians, the present study is aimed at determining the incidence and the degree of variations of this muscle amongst Nigerian males. It is hoped that information arising from this investigation will provide a database for the use of this muscle in graft and free flap surgeries in Nigeria.

### MATERIALS AND METHODS

Twenty-four male cadavers from the Anatomy Laboratories of the University of Port Harcourt, Nnamdi Azikiwe University, and the University of Nigeria Nsukka, Enugu campus

were used in this study.

The muscle was reached through a Pfannenstiel incision as described by Van Landuyt *et al* (2003) with modification. A midline incision of the abdomen, a point midway between the umbilicus and the pubic symphysis was made up to the pubic symphysis. From the superior margin of the midline incision, a horizontal incision was made on each side to the axillary line, and also from the inferior margin a horizontal incision was made on each side along the iliac crest up to the iliac tubercle. The skin was then reflected and the superficial fascia removed. After dissecting the anterior rectus fascia on both sides of the midline, the anterior rectus sheath was incised longitudinally about 3cm lateral of the midline for observation and measurement of the pyramidalis muscle. The parameters measured were the length, which was taken from the apex to the midpoint of the base and the breadth, which was taken at the widest area i.e. the base of the right and left Pyramidalis muscle using a pair of dividers whose readings were taken from a measuring tape.

Data were tabulated and statistically analysed using the Student's t-test at 95% significant level with the aid of SPSS version 15.

## RESULTS

Table 1 shows the incidence of agenesis,

mean length and breadth of the pyramidalis muscle in Nigerian males. Twenty two out of the 24 cadavers used in this study had the presence of pyramidalis muscle. This represents 91.67% occurrence. The incidence of agenesis in both right and left sides is 8.33%. No incidence of unilateral occurrence or supernumerary presence of the muscle on any side was found. The mean values for the length of the Pyramidalis muscle were 8.09cm  $\pm$  1.70 for the right and 7.94cm  $\pm$  1.71 for the left. While the breadth were 1.55cm  $\pm$  0.28 for the left and 1.64  $\pm$  0.30 cm

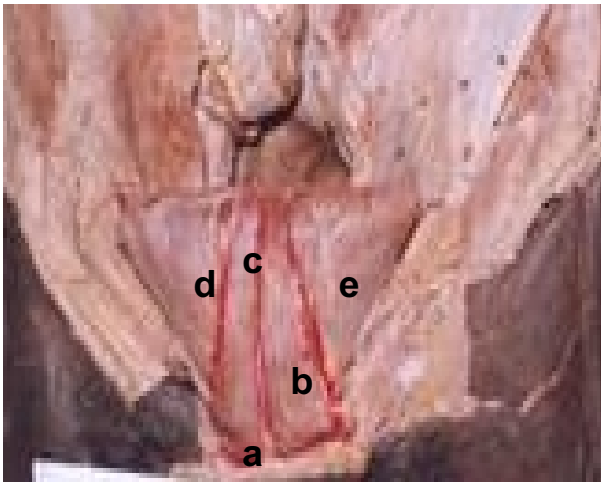
The pyramidalis muscle was found to insert at lower (inferiorly at variable distance upon the ramus of the pubis) and higher (at variable distance higher than the point midway on the linea alba between the umbilicus and pubic symphysis) than normal in some cadavers. The prevalent shape is triangle. Table 2 shows the incidence of agenesis of the pyramidalis muscles and the mean values of its dimensions amongst Nigerians compared to other nationals previously studied. Figures 1, 2 and 3 show the presence or absence of the pyramidalis muscle.

**Table 1: The incidence of agenesis, mean length and breadth of the pyramidalis muscle in Nigerian males**

Parameters	Right pyramidalis muscle	Left pyramidalis muscle
Incidence of unilateral agenesis	0.00%	0.00%
Incidence of bilateral agenesis	8.33%	8.33%
Mean length (cm) + SD	8.09 1.70	7.94 1.71
Mean breadth (cm) + SD	1.55 0.28	1.64 0.30
Sample size	24	24

**Table 2: Comparative data on the incidence of agensis and mean length and breadth of the pyramidalis muscle in various nationals**

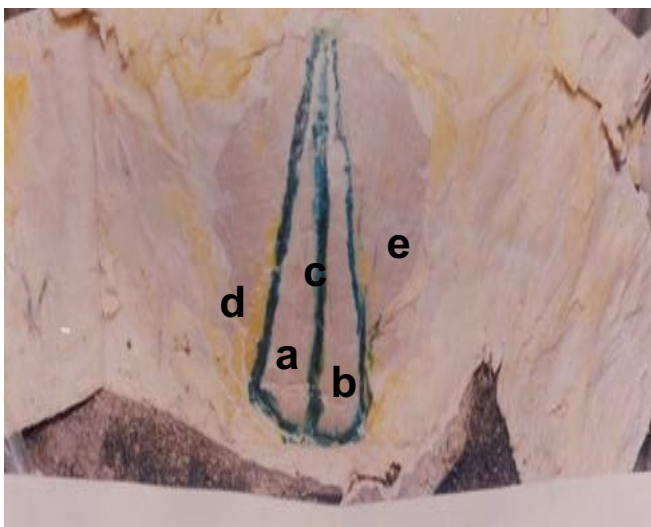
NATIONALITY	AUTHOR & DATE	INCIDENCE OF AGENESIS (%)	MEAN LENGTH (cm)	MEAN BREADTH (CM)
Polish	Loth (1913)	11.30	6.20	1.82
French	Vallois (1926)	17.70	7.17	2.03
American (white)	Beaton & Anson (1939)	20.30	6.39	1.86
Japanese	Nakaruma (1935)	3.30	6.77	1.92
Indian (males)	Jit et al (1988)	16.94	-	-
Indian (females)	Jit et al (1988)	36.83	-	-
Pakistan	Riaz et al (1999)	33.4	-	-
America	Dwight (1893)	21.0	-	-
French	Ancel (in Vallios)	27.2	-	-
Chinese	Nakano (1923)	0.00	-	-
Chinese	Wegenseil (1923)	2.90	-	-
American (Blacks)	Beaton & Anson (1939)	12.50	6.69	1.82
Chinese	Kurz (1923)	0.00		
Nigerian (males)	Present study (2007)	8.33	8.09 (right) 7.94 (left)	1.55 (right) 1.64 (left)



**Fig 1: Research Cadaver With Presence of the Pyramidalis Muscle**



**Fig 2: A Research Cadaver With agenesi of the Pyamidalis Muscle**



**Fig 3: Diagram Showing The Different Sizes And Levels Of Insertion Of The Pyramidalis Muscle In Different Cadavers**

Key a = Right Pyramidalis muscle, b = left Pyramidalis muscle c = line alba, d = Rectus abdominis muscle (right) e = Rectus adbmominis muscle (left), f = absence of Pyramidalis muscle.

### DISCUSSION

We have investigated the incidence and peculiarities of the pyramidalis muscles amongst adult males in Nigeria. The existence of variation in occurrence, shape and size amongst the major population of the world has been confirmed (Beaton and Anson 1938, 1939). The 8.33% incidence of agenesi of the Pyramidalis muscle in Nigerian males compares favourably with the values reported for Indian males (10.48%) (Jet *et al* 1986). Although the ratio of agenesi in Americans (17.7% - 22.5%), Polish (18%), French (17.7%) and Pakistani (33.4%) nationals are higher

compared to Nigerians, this research however further confirmed the general observation that within a given population there is agenesi of the muscle (table 2).

The mean dimensions of the muscle in Nigerians are at variance with those of the Polish, French, American and Japanese. Variation in size is not significant ( $P > 0.05$ ) in this present study compared to Indian subjects that is significant ( $P < 0.05$ ) (Sinha *et al* 1985), however there were variations in origin and insertion. Absence of the muscle did not show any form of deformity in the subjects studied.

**REFERENCES**

- Anson J, Beaton L(1939). The pyramidalis muscle: Its occurrence and size in America whites and negroes. *America Journal of Physical Anthropol.* Vol XX, No.2
- de Leval J, Bouffieux C Pender L (1984). Cure d'incontinence par fixation duvagin à un lambeau pyramidal,200 observations. *Acta Urol Belg.* **52**(2):286-90
- Dwight T (1893). Observations on the psoas parvus and pyramidalis. A study of variations. *Proc. Am. Phil. Soc.* **XXXI**: 117-123.
- Hallet CH (1848). An account of anomalies of the muscular system met with in the dissecting-room of the university during the year 1846-1847, with general remarks. *Edinburgh Med & Surg. J.* **LXIX**: 1-32
- Jit I, Banga N (1986). Incidence of pyramidalis muscle in North Indian subjects. *Journal of the Anatomical Society of India.* **35** (1): 21-27
- Kounosuke Kokita (2006). Anatomical significance of the nerve to the pyramidalis muscle. A morphological study. *Anatomical Science International* **81**: 210-224.
- Kurz E (1922). Untersuchungen zur anatomie der weichteile beim chisen unter beruckaichtigung des verhaltens bei den affen. *Z, Anat. & Entwicklungsgesch.* **LXVII**: 232-285
- LeDouble AF (1987). Traite des variation du systeme musculaire de l'Homme et de leur signification au point de vue de l'Anthropologic zoologic.
- Loth E (1919). Anthropologic des muscles. *Bull and mem. Soc. Anthropol. Paris* **X**: 116-133
- Moore KL, Dalley F A (1999). *Clinically oriented anatomy.* Fourth Edition. Baltimore, Lippincott Williams & Wilkins. 180pp.
- Nakano T (1923). Beitrage zur antomie der Chisen. Die statistik der muskelvarietateen. *Folia Anat. Japaon* **1**: 273-282.
- Nakaruma S (1935). Ueber den M. rectus abdominis und den M. pyramidalis de Japaner (aus Kyushu). *J. Kumamoto Med Soc.* **xi**: 1251-1261.
- Parent B (1973). La suspension du vagin aux pyramidaux, modification del' intervention de marshall-marchetti. *J. Gynecol. Obstet. Biol Reprod (Paris)* **2**(5):553-60
- Riaz A , Abdul R , Ihsan U, Syed I (1999). Study of human Pyramidalis muscle in Pakistani population. *Ann King Edward Med Coll. Journal.* **5**(2): 192-193.
- Sinha DN, Kumar V (1985). Study of Human pyramidalis muscle in Indian subjects. *Anthropol Anz J.* **43** (2): 173- 177
- Skandalakis JE, Skandalakis PN, Skandalakis J L (1995). *Surgical anatomy and technique. A pocket manual.* New York, Springer-Verlag.
- Sinnatamby SC(1999). *Last's Anatomy: Regional & Applied,* Tenth Edition. Edinburgh, Churchill Livingstone. 218pp
- Testut L (1884). *Les Anomalies chez l'Homme dan les Paris.* Vallois HV (1925). Valeur et signification du muscle pyramidal de l'abdomen. *Arch. Anat. Histol. and Embryol.* **V**: 99-525
- Van Landuyt K, Hamdi M, Blondeel P, Monstriag S (2003). The pyramidalis muscle free flap. *The British Association of Plastic Surgeons.* **56**:585-592.
- Wegenseil F (1927). Muskelbefunde bei Chinesen. *Verhand. Gesell. phys. Anthropol.* **11**: 42-50.
- Wiedersheim R (1907). *Comparative anatomy of vertebrate.* (Translated by W.N. Parker, Third Edition) London
- Williams PL, Warwick R, Bannister L (1995). *Gray's Anatomy: The anatomical bases of medicine and surgery* Thirty-sixth Edition. Edinburgh Churchill Livingstone. 558pp