

Anatomical Research

Misconceptions and opportunities

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IN GENERAL, THE POPULARITY OF THE anatomical sciences has lessened over recent years, as testified by the decreased amount of funding allocated to anatomical research.¹ This may have negative repercussions in terms of recruiting Omani students who aspire to be anatomists. A common fallacy in the scientific academic sphere is that anatomy is outdated and irrelevant. New discoveries in this discipline are thought to be limited as exhaustive investigative and descriptive research has been published over many centuries and a huge body of literature is available on all aspects of anatomy.² Nevertheless, although researchers differ in their investigative works and techniques, anatomical variations—defined as peculiarities, irregularities or abnormalities in structural morphology or a marked deviation from the average or norm—continue to offer new discoveries and opportunities for extended work in various fields.³ By dissecting cadavers and analysing X-rays, angiograms and imaging scans, anatomical research can be inexpensive and requires only sharp observational skills.^{2,3}

There are four clinically significant types of anatomical anomalies: malformations, disruptions, deformations and dysplasias.⁴ Anomalies are increasingly reported in the medical literature, as exemplified by a series of case reports and interesting medical images featured in the August 2016, November 2016 and February 2017 issues of *SQUMJ*.^{5–9} This in turn suggests that there are still many discoveries to make in the field of anatomy. While such anomalies are rare, their recognition has important implications for diagnosis and treatment. Although case reports are sometimes dismissed as being the least valuable form of research publication, a rare case might represent an interesting phenomenon.¹⁰ Moreover, it is critical that potential morphological and structural variations be taken into consideration in everyday surgical practice as a lack of awareness could lead to fatal consequences.

Murugan *et al.* reported an anomalous sternothyroid muscle characterised by a lateral belly which passed between the internal jugular vein and internal carotid artery and between the glossopharyngeal and hypoglossal nerves to the site of insertion.⁵ In this case, ossified tissue had also bridged over the right sigmoid *sulcus*, thus compressing the sigmoid sinus.⁵ This anomalous belly could potentially lead to the development of Collet-Sicard syndrome secondary to internal jugular vein thrombosis, unilateral palsy of the involved nerves or idiopathic epileptic seizures due to impaired cerebral venous drainage into the internal jugular vein.¹¹ Another report of an anomalous anatomical variation described an additional accessory duct of the right submandibular gland; the anomalous duct drained into the floor of the mouth, while the main duct followed the normal anatomical pathway and drained at the top of the *papilla*.⁶ Recognising the presence of an anomalous duct is important in diagnosing and treating diseases of the salivary gland and to avoid iatrogenic injuries to these ducts during surgery.¹²

Bhat *et al.* reported a case whereby the *flexor carpi radialis* muscle originated from a lateral slip of bicipital *aponeurosis* and the median cubital vein was located deep to the two slips of the *aponeurosis*.⁷ This vein is commonly accessed for medical procedures ranging from simple venepuncture for routine blood collection to the formation of arteriovenous *fistulae* and the insertion of cardiac catheters; as such, a median cubital vein located deep to the *aponeurosis* can pose difficulties for practitioners who wish to access this vein.¹³ Raza *et al.* reported a case in which the musculocutaneous nerve was found to be absent during a routine dissection session.⁸ The median nerve innervated all of the *flexor* muscles of the forearm, except for the *coracobrachialis* muscle, and branched into the lateral cutaneous nerve of the left forearm. The *coracobrachialis* muscle was innervated

by a branch of the lateral root of the median nerve.⁸ Such anatomical variations may present atypically in patients who suffer from paralysis after trauma to the median nerve and pose a challenge when regional anaesthesia is required.¹⁴

Deshmukh *et al.* reported another anatomical anomaly in that the *obturator* artery originated from the superior gluteal artery in a female cadaver.⁹ According to a study conducted by Rajive *et al.*, this anomaly was observed in 2% out of 50 cadavers.¹⁵ However, in the same case reported by Deshmukh *et al.*, the left *obturator* vein crossed the pelvic brim and drained into the external iliac vein.⁹ This variation has important implications during open and laparoscopic surgeries involving the pelvis, such as hernia repairs and gluteal muscle grafts in females undergoing breast augmentation.^{16,17}

In human morphology, we often observe anatomical and functional modifications or variations. Indeed, certain structures have lost their original function but are still useful for other purposes, such as with the *occipitofrontalis* muscle in lower primates, which once served to keep the head lifted up but is now used for facial expressions.¹⁸ Humans also exhibit various vestigial behaviours and reflexes. The formation of *cutis anserina* (i.e. goose bumps) under stress is an example of a vestigial reflex in humans; for lower primates, its function was probably to raise the body's hair to appear larger and scare off predators. Another example of a vestigial reflex is that infants will instinctively grasp any object which touches their palm, in some cases strongly enough to support their own weight.¹⁸ Such observations and findings can be explored and researched in areas of comparative and developmental anatomy.

In conclusion, anatomical research is still very much alive and relevant. There are many aspects of anatomy that may provide good topics for research, such as osteology, morphometry, histology, staining techniques and neuroanatomy. In particular, embryology is a field in which further exploration is much needed. Successful outcomes in clinical practice are dependent on discoveries in basic medical sciences, such as in the case of anatomical variations. Deviations from normal anatomy can, at times, be critical to surgeons when operating on patients. Such data are worth researching and publishing to enrich the existing medical literature.

References

1. McDaniel A, Fullen DR, Cho KR, Lucas DR, Giordano TJ, Greenson J, et al. Funding anatomic pathology research: A retrospective analysis of an intramural funding mechanism. *Arch Pathol Lab Med* 2013; 137:1270–3. doi: 10.5858/arpa.2012-0546-OA.
2. Bardeen CR. The teaching of anatomy and the inculcation of scientific methods and interest: The value of the Roentgen-ray and the living model in teaching and research in human anatomy. *Anat Rec* 1918; 14:337–40. doi: 10.1002/ar.1090140602.
3. Sañudo JR, Vázquez R, Puerta J. Meaning and clinical interest of the anatomical variations in the 21st century. *Eur J Anat* 2003; 7:1–3.
4. Farlex Partner Medical Dictionary. Anomaly. From: www.medical-dictionary.thefreedictionary.com/anomaly Accessed: Feb 2017.
5. Murugan MS, Sudha R, Bhargavan R. Clinical significance of an unusual variation: Anomalous additional belly of the sternothyroid muscle. *Sultan Qaboos Univ Med J* 2016; 16:e491–4. doi: 10.18295/squmj.2016.16.04.015.
6. Billakanti PB. Accessory duct of the submandibular gland. *Sultan Qaboos Univ Med J* 2017; 17:e119–20. doi: 10.18295/squmj.2016.17.01.023.
7. Bhat N, Bhat KM, D'Souza AS, Kotian SR. Additional muscle slip of bicipital aponeurosis and its anomalous relationship with the median cubital vein. *Sultan Qaboos Univ Med J* 2017; 17:e103–5. doi: 10.18295/squmj.2016.17.01.018.
8. Raza K, Singh S, Rani N, Mishra R, Metha K, Kaler S. Anomalous innervation of the median nerve in the arm in the absence of the musculocutaneous nerve. *Sultan Qaboos Univ Med J* 2017; 17:e106–8. doi: 10.18295/squmj.2016.17.01.019.
9. Deshmukh V, Singh S, Sirohi N, Baruhhe D. Variation in the obturator vasculature during routine anatomy dissection of a cadaver. *Sultan Qaboos Univ Med J* 2016; 16:e356–8. doi: 10.18295/squmj.2016.16.03.016.
10. Carey JC. The importance of case reports in advancing scientific knowledge of rare diseases. *Adv Exp Med Biol* 2010; 686:77–86. doi: 10.1007/978-90-481-9485-8_5.
11. Neo S, Lee KE. Collet-Sicard syndrome: A rare but important presentation of internal jugular vein thrombosis. *Pract Neurol* 2017; 17:63–5. doi: 10.1136/practneurol-2015-001268.
12. Pownell PH, Brown OE, Pransky SM, Manning SC. Congenital abnormalities of the submandibular duct. *Int J Pediatr Otorhinolaryngol* 1992; 24:161–9.
13. Chevuturu C, Somasekhar M, Maitra S, Agarwala MK. Prophylactic ligation of the median cubital vein to improve the patency of a radio cephalic fistula. *Adv Surg Sci* 2016; 4:1–5. doi: 10.11648/j.ass.20160401.11.
14. Neal S, Fields KB. Peripheral nerve entrapment and injury in the upper extremity. *Am Fam Physician* 2010; 81:147–55.
15. Rajive AV, Pillay M. A study of variations in the origin of obturator artery and its clinical significance. *J Clin Diagn Res* 2015; 9:AC12–15. doi: 10.7860/JCDR/2015/14453.6387.
16. Tajra JB, Lima CF, Pires FR, Sales L, Junqueira D, Mauro E. Variability of the obturator artery with its surgical implications. *J Morphol Sci* 2016; 33:96–8. doi: 10.4322/jms.090015.
17. Mu LH, Yan YP, Luan J, Fan F, Li SK. [Anatomy study of superior and inferior gluteal artery perforator flap]. *Zhonghua Zheng Xing Wai Ke Za Zhi* 2005; 21:278–80.
18. Muller GB. Vestigial organs and structures. In: Pagel M, Ed. *Encyclopedia of Evolution*, 1st ed. New York, USA: Oxford University Press, 2002. Pp. 1131–3.