e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2024; 14(5); 183-187

Original Research Article

An Anatomical Study of the Arterial Supply to the Caecum and Vermiform Appendix in Humans

Pankaj Kumar[1], Amish Kumar[2], Shambhu Prasad[3]

[1]Assistant Professor, Department of Anatomy, NMCH, Jamuhar, Sasaram
[2]Senior Resident, Department of Anatomy, NMCH, Jamuhar, Sasaram
[3]Professor & Head, Department of Anatomy, NMCH, Jamuhar, Sasaram

Received: 11-02-2024 / Revised: 12-03-2024 / Accepted: 25-04-2024
Corresponding Author: Dr. Amish Kumar
Conflict of interest: Nil

Abstract

Background and Objectives: The surgical procedures like right hemicolectomy and appendicectomy on the caecum and appendix demands a precise knowledge of vascular anatomy of ileocolic region. The aim of this study is to study the arterial supply of the caecum andappendix, findings of which may reveal more anatomical facts about the arteries of caecum and appendix and their variations.

Methods: Total 32 specimens of caecum and appendix with their arteries intact were collected, cleaned and dissected. The ileocolic artery and its branches to the caecum, appendix and ileum were traced carefully and observations were recorded.

Results: The ileocolic artery arises independently from superior mesenteric artery in 96.88% of cases and ends by dividing into superior and inferior division in 93.76% of cases. The anterior and posterior caecal arteries arise by a common trunk in 56.25%. The appendicular artery arises from inferior division in 46.88%, ileal branch 28.13%, ileocolic artery 18.75% and from arterial arcade in 6.25% of cases. 21.87% of cases showed additional appendicular artery.

Conclusion: The ileocolic artery arises from the superior mesenteric artery independentlyin 96.88% and terminates into superior and inferior division in 93.76% of cases. Common caecal artery seen in 56.25% of cases, arises from inferior division (43.75%), superior division (9.38%) and ileocolic artery (3.12%).

Keywords: Superior Mesenteric Artery, Ileocolic Artery, Anterior Caecal Artery, Posterior Caecal Artery, Appendicular Artery, Caecum, Appendix.

Introduction

Man is always fascinated by the anomalies that he comes across during the study of anatomy. Vascular anomalies always pose a great challenge to the anatomistsand surgeons. The surgical trauma to the sustaining blood vessels is irrepairable and lead to fatal necrosis of the part involved. Holstead, a pioneer American surgeon has said that the best way to avoid injury to the blood vessels is to know how, when and where to ligate them. The responsibility of studying the arterial variations lies with anatomists, the knowledge of which helps the surgeons. In the present study anattempt is made to study the variations of the arteries supplying caecum and appendix. Caecum has got great importance, because it is prone for many pathological conditions like ileocaecal tuberculosis, carcinoma, obstruction to the ileocaecal junction due to intussusceptions, hernia of caecum, ulcerative colitis, Crohn's disease,infarction of caecum, volvulous, diverticulosis of caecum, caecal varices [1] etc. So surgical procedures like right hemicolectomy, mesenteric lengthening right colon lymphadenectomy, [2] therapeutic embolization [3] in case of bleeding, laproscopic intestinal surgeries [4] demand a precise knowledge of vascular anatomy of ileocolic region. Similarly surgical procedures like appendectomy, which is one of the commonsurgical procedures in case of appendicitis, appendicular carcinoid tumors etc. require precise knowledge about the arteries supplying the caecum and appendix and the possible variations to avoid intra and post-operative complications like hemorrhage. Literature pertaining to the vascular anatomy of caecum and appendix is vast but most of it pertains to the western people. There is need for the study of blood supply to the caecum and appendix in Indian population. With this point of view, the present study is undertaken to know the number ofarteries supplying the caecum and appendix, their source of origin and mode of branching in 32 human cadavers [5]

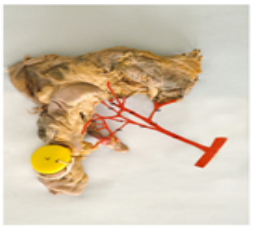
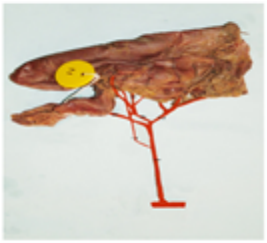
Objectives

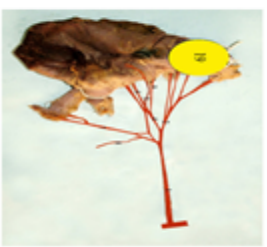
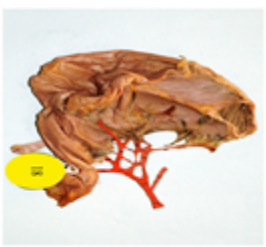
This work has been undertaken to study the arterial supply of the caecum and vermiform appendix, findings of which may reveal more anatomical facts about the arteries of caecum and vermiform appendix and their variations.

Material and Method

The arterial supply of the human caecum and appendix was studied in 32 human specimens. The specimens were collected from the Post-mortem Centre, Department of Anatomy and Forensic Medicine, Narayan Medical College and Hospital Jamuhar, Sasaram Rohtas. The whole specimen that is the caecum, the appendix, part of the ascending colon and terminal part of the ileum, and part of the superior mesenteric artery with ileo-colic artery and its branches were separated from the surrounding structures after noting the relations of the ileocolic artery and its branches. Thus collected specimens were preserved in 5% formalin. After the preservation, the specimens were dissected, cleaned and numbered. Theileocolic artery and its branches to the caecum, appendix and ileum were traced carefully and observations were recorded. The caecal arteries, both anterior and posterior caecal, and their branches were traced on the caecum. Photographs of the specimens were taken and digitally painted.



Results

The ileocolic artery divides into superior and inferior divisions. The inferior division gives off anterior caecal artery, posterior caecal artery, ascending colic branch and ileal branch. Anterior caecal artery supplies the anterior surface of the caecum. Posterior caecal artery makes an arcade with a branch from the ascending colic. Two posterior caecal arteries arise from the arcade supplying the posterior surface of the caecum. The appendicular artery arises from the arcade formed between the ascending colic and posterior caecal arteries. The ileocolic artery divides into ascending, common caecal and ileal branches. Common caecal artery makes an anastomosis with a branch from the appendicular artery and further divides into anterior caecal artery supplying the anterior surface of the caecum and posterior caecal artery supplying the posterior surface of the caecum. The appendicular artery arises from the ileal branch supplying the appendix; it makes an anastomosis with the common caecal artery. The ileocolic artery divides into superior and inferior divisions. The anterior caecal artery arises from the superior division; divides into multiple branches before supplying the anterior surface of the caecum. The inferior division gives off appendicular, posterior caecal and ileal branches. There are two posterior caecal arteries, upper one arising directly from the ileocolic artery and the lower one arising from the inferior division, supplying posterior surface of the caecum. The appendicualr artery arises from the inferior division supplying the appendix. There is anastomosis between anterior caecal artery and the lower posterior caecal artery. The ileocolic artery divides into superior and inferior divisions. The inferior division gives of ascending colic, ileal and appendicular arteries. The anterior and posterior caecal arteries arise from ileal branch supplying anterior and posterior surface of the caecum respectively. The appendicular artery arises from inferior division.

The ileocolic artery divides into superior and inferior division. The superior division gives off common caecal artery. The inferior division continues as ileal artery. The common caecal artery divides into anterior and posterior caecal arteries supplying anterior and posterior surfaces of the caecum respectively. There are two appendicular arteries, one arising from the posterior caecal artery and the other directly from the ileocolic artery. The ileocolic artery divides into superior and inferior divisions. The inferior division gives off ileal and common caecal arteries.

The common caecal divides into anterior and posterior caecal arteries supplying anterior and posterior surfaces. The posterior caecal artery gives off an appendicular artery and ascending colic branch. There are two appendicular arteries one from the ileal branch and one from the posterior caecal artery. The ileocolic artery divides into superior and inferior divisions. The superior division continues as ileal branch and gives off ascending colic, anterior and posterior caecal arteries. The inferior division gives off appendicular and ileal branches. The appendicular artery arises from the inferior division; supplies the appendix. There is anastomosis between superior division and the ileal branch from the inferior division. The ileocolic artery divides into superior and inferior divisions. The inferior division divides into common caecal and ileal branches. The common caecal divides into anterior caecal and posterior caecal arteries. The anterior caecal artery divides and supplies the anterior surface of the caecum; it forms an arcade with the ileal branch. One anterior and one posterior caecal arteries arise from this arcade. The posterior caecal artery gives off ascending colic branch and further divides into smaller branches to supply the posterior surface of the caecum. The appendicular artery arises from the ileal branch and supplies the appendix. The ileocolic artery gives off anterior caecal, posteriorcaecal and appendicular artery and continues downwards as ileal artery.The anterior caecal artery divides and supplies the anterior surface of the caecum. The posterior caecal artery branches and supplies posterior surface of the caecum. The appendicular artery directly arises from the ileocolic artery; it gives off an ileal branch; further it divides into multiple branches and supplies the appendix. There is anastomosis between anterior and posterior caecal arteries.

The ileocolic artery divides into superior and inferior divisions. The superior division gives off common caecal artery, which divides into anterior and posterior caecal arteries, supplying anterior and posterior surfaces of the caecum respectively. The inferior division continues as ileal branch. The appendicular artery directly arises from the ileocolic artery. It makes an anastomosis with the common caecal artery. The ileocolic artery divides into superior and inferior divisions. The inferior division gives off common caecal and ileal branches. The common caecal artery gives off an ascending colic branch and later it divides into anterior and posterior caecal arteries.

There is an extra anterior caecal artery, which is arising from the ileal branch; it supplies the anterior surface of the caecum. An appendicular artery arises from the arcade formed between ileal and common caecal arteries. A second appendicular artery arises from posterior caecal artery. The ileocolic artery divides into superior and inferior divisions. The common caecal artery arises from the superior division; it gives an ascending colic branch and later divides into anterior and posterior caecal arteries, supplying anterior and posterior surfaces of the caecum respectively. The inferior division divides into posterior caecal and ileal branches. The appendicular artery

arises from the ileal branch; it makes an anastomosis with the posterior caecal artery. The ileocolic artery divides in superior inferior divisions.The inferior division gives off ascending colic branch, anterior caecal, appendicular and ileal branches. The posterior caecal artery arises from the ascending colic branch and supplies the posterior surface of the caecum. The appendicular artery arises from the inferior division of the ileocolic artery.The ileocolic artery divides into superior inferior divisions.

The inferior division gives off anterior caecal supplying anterior surface of the caecum, posterior caecal supplying posterior surface of the caecum and ileal branch. The ileocolic artery divides into superior and inferior divisions. The superior division gives the posterior caecal artery, which supplies the posterior surface of the caecum. The inferior division gives off ileal, anterior caecal and appendicular arteries. The appendicular artery arises from the inferior division and makes an anastomosis with posterior caecal artery.

Discussion

Among the anatomical variations, variations in the arterial pattern are more striking, most baffling and most widespread. Over the years anatomists have described the diversity in the arterial patterns in the human body. In the present study, 32 specimens were studied for the arteries supplying caecum and vermiform appendix. The findings of the study have been compared with those of previous workers on the subject.

Table 1 : Origin of the ileocolic artery

Separately from superior mesenteric artery	31 specimens	96.88%
In common with right colic artery	1 specimen	3.12%

In the present study, the ileocolic artery arises from the right side of the superior mesenteric artery independently in 31 cases (96.88%), in one case (3.12%) it arises in common with right colic artery. Barry J. Anson (1966)[13] mentions the origin of ileocolic artery independently from the superior mesenteric artery in 65% of cases and in 35% of cases it arises in common with the right colic artery. The origin of ileocolic artery either independently or in common with the right colic artery, has also been mentioned by Piersol (1907)[7], Cunningham (1981)[4] and Michel R B (1993)[5]. In the present study, the ileocolic artery ends by dividing into superior and inferior division in 30 cases (93.76%).

Table 2 : Termination of the ileocolic artery

Superior and inferior division	30 specimens	93.76%
Ascending colic, common caecal & ileal branches	1 specimen	3.12%
Anterior caecal, Posterior caecal, Appendicular & Ileal branches	1 specimen	3.12%

Solanke T F (1968)[15] mentions that the division of ileocolic artery into medialand lateral branches of unequal caliber is found only in 15% of cases; remaining 85% of the cases it remains single. Cunningham (1981)[4] illustrates the termination of ileocolic artery into ascending and descending branches. Michel R B (1993) also describes the termination of the ileocolic artery into ascending colic and the descending branch which divides into anterior caecal, posterior caecal, appendicular and ileal branches. Patrick W (1993) [6] states the termination of the ileocolic artery into colic and ileal branches, which is similar to findings of the present study. In the present study, in one specimen (3.12%) the ileocolic artery terminatesby dividing into ascending colic, common caecal, and ileal branches. [7] The findings are similar to the same finding by Piersol (1907) Schaffer (19537, Vandamme J P (1982) [8], Mc Minn R M H (1994). In the present study, in one specimen (3.12%) the ileocolic artery terminates dividing into four branches, anterior caecal, posterior caecal, appendicular and ileal branches. Grant's (1972) states the similar pattern of termination of the ileocolicartery into four branches. Common caecal artery. [9] In the present study the anterior caecal and posterior caecal, which supply the anterior and posterior surfaces of the caecum take their origin by a common trunk (common caecal artery) in 18 specimens (56.25%). Piersol (1907) mentions the same in his study that the artery supplying the caecum is a branch of the ileocolic artery which divides into anterior and posterior caecal arteries. Michel and co-workers (1963) [10] in their study found the anterior and posterior caecal arteries arising from a common trunk in 36% of cases. Anson and Mcvey (1971) [11] stated the origin of anterior and posterior caecal arteries by a common trunk. Ures et al. (1979) [12] mentioned the origin of anterior and posterior caecal arteries by a common caecal artery in 76.2% of cases. Bergmann (1988) [13] mentioned the same in 13.5% of cases (unpublished report of Beaton, Anson, Swigart and Jamieson).

In the present study the common caecal artery found in 18 specimens originated from the superior division in 3 specimens (9.38%), from that inferior

division in 14 specimens (43.75%) and from the ileocolic artery in one specimen (3.12%).

Table 3 : Origin of common caecal artery in 18 specimens (56.25%)

Superior division	3 specimens	9.38%
Inferior division	14 specimens	43.75%
Ileocolic artery	1 specimen	3.12%

Michel and co-workers (1963)[12] mentioned the origin of common caecalartery from an arcade between colic and ileal branches in 76%, less frequently from either ascending colic, ileal or ileocolic trunk. showed anastomosis between appendicular and ilealbranches. showed anastomosis of appendicular artery with commoncaecal artery. Michel Simon (2000) [14] mentioned the anastomosis between the appendicularartery and the ileal branch of the superior mesenteric artery.

Conclusion

The present study on the arterial supply of human caecum and vermiform appendix shows that the origin of ileocolic artery is from the right side of the superior mesenteric artery independently and it terminates by dividing into superior and inferior divisions in majority of cases. There is common caecal artery in more than half of the cases (56.25%), which originates from inferior division in 43.75%; superior division 9.38 % and ileocolic artery 3.12 %. In 56.25% of the specimens the anterior and posterior caecal arteries originate from the common caecal artery. Other sites of origin for anterior caecal artery are superior division 12.5 %; inferior division 15.63 %; ileocolic artery 3.12 %; ileal branch 6.25 % and an arterial arcade in 6.25 % of cases. Other sites of origin for the posterior caecal artery are superior division 18.76%; inferior division 9.38 %; ileal branch 3.12 %; ileocolic artery 3.12 %; ascending colic branch of inferior division 3.12 % and from an arterial arcade in 6.25% of cases.

References

1. Neil J, Mortensen MC, Oliverjones. The small and large intestines. Chapter 68. In: Russel RCG, Norman SW, Christopher, Bulstrode JK, editors. Bailey and Love's short practice of surgery. 24th ed: London: Arnold Publications. 2004:1153-1186.
2. Shatari T, Fujita M, Nozawa K, Haku K, Niimi M, Ikeda Y, et al. Vascular anatomy for right colon lymph adenectomy. Surgical and RadiologicAnatomy: SRA. 2003May;25(2): p. 86-8.
3. Ashaur MA, Millward SF, Hadziomerovic A. Embolotherapy of a dieulafoy lesion in the cecum. J Vasc Interv Radiol 2000 Sep; 11(8):1059-62.
4. Romanes GJ. Cunningham's Textbook of Anatomy 12th ed. Walln Street Oxford. Oxford University Press. 1981;926-27.
5. Michael RBK, Norman SW. Surgery of Anus, Rectum and colon. Vol.1. Philadelphia. W.B. Saunders Company. 1993;11.
6. Patrick WM, David HL, Martin AL, Anthony JS, Surgery of the colon, rectum and anus. 1st ed. Philadelphia. W.B. Saunders Company. 1995:18.
7. Schaffer WJ. Morri's human anatomy. 11th ed. Toranto. 1953; p.709.
8. Vandamme JP, Bonte J. A new look at the blood supply of the ileocolic angle. Acta Anat (Basel). 1982;113(1):1-14.
9. Mcminn RMH. Last's Anatomy. 9th ed. Edinburgh. Churchill Livingstone. 1994; 3 38-39.
10. Michels NA, Siddharth P, Kornblith PL, Parke WW. The variant blood supply to the small and large intestines, its importance in regional resections. A new anatomic study based on 400 dissections with complete review of literature. J Int Coll Surgeons 1963; 39:127.
11. Anson BJ, McVey CB. Surgical anatomy. 5th ed. Philadelphia. W.B. Saunders Co. 1971.
12. Ures J, Stacchini A, Prates JC, Gatto IM, Ures S Angiographic anatomy of the cecal artery. Arq Gastroenterol. 1979 Jan-Mar; 16(1):8-11.
13. Ajmani ML, Ajmani K. The position, length and arterial supply of vermiform appendix. Anat Anz 1983;153(4):369-74.
14. Simon AM, Birnbaum BA, Jacobs JE. Isolated infarction of the cecum: CT findings in two patients. Radiology 2000 Feb;214(2):513-6.