# Management of Hemorrhoids with Doppler-Guided Hemorrhoidal Artery Ligation

*Thesis*

*Submitted for Partial Fulfillment of the Master Degree in General Surgery*


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*2019*


سورة البقرة الآية: ٣٢

# Acknowledgment

*First and foremost, I feel always indebted to* **ALLAH**,
*the Most Kind and Most Merciful.*

*I'd like to express my respectful thanks and profound gratitude to* **Prof. Dr. Reda Saad Mohamed,** *Professor of General Surgery Faculty of Medicine-Ain Shams University for his keen guidance, kind supervision, valuable advice and continuous encouragement, which made possible the completion of this work.*

*I am also delighted to express my deepest gratitude and thanks to* **Prof. Dr. Tarek Youssef Ahmed,** *Assistant Professor of General Surgery Faculty of Medicine-Ain Shams University, for his kind care, continuous supervision, valuable instructions, constant help and great assistance throughout this work.*

*I am deeply thankful to* **Dr. Mohammed Abd Almegeed Alsayed,** *Lecturer of General Surgery Faculty of Medicine- Ain Shams University, for his great help, active participation and guidance.*

**Ahmed Ragab Hegazy**

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# List of Abbreviations

| Abb. | Full term |
|---|---|
| DDD | Dearterialization |
| ET | Endothelin |
| HAL | Haemorrhoidal artery ligation |
| MMP | Matrix metalloproteinases |
| NGAL | Neutrophil gelatinase-associated lipocalin |
| NSAIDs | Nonsteroidal anti-inflammatory drugs |
| PPH | Procedure for prolapse and hemorrhoids |
| THD | Total harmonic distortion |

# INTRODUCTION

The term "hemorrhoids" refers to the abnormal downward displacement of anal cushions which are prominences of anal mucosa formed by loose connective tissue, smooth muscle, and arterial and venous vessels. Hemorrhoids develops during the course of life and is a very common anorectal disorder ***(Thomson, 1975).***

The most common symptom of hemorrhoids is painless rectal bleeding of bright red blood associated with bowel movement, and sometimes with prolapsing anal tissue. A precise history and thorough physical examination, including digital rectal examination and proctoscopy, are imperative for the diagnosis of hemorrhoids ***(Alonso-Coello et al., 2006).***

Hemorrhoids are generally classified by their location: internal (originates above the dentate line and covered by anal mucosa); external (originates below the dentate line and covered by anoderm); and mixed type ***(Lohsiriwat et al., 2011).***

The current pathophysiologies of hemorrhoids include the degenerative change of supportive tissue within the anal cushions, vascular hyperphlasia, and hyperperfusion of hemorrhoidal plexus. Low-grade hemorrhoids are easily and effectively treated with dietary and lifestyle modification, medical intervention, and some office-based procedures. An

operation is usually indicated in symptomatic high-grade and/or complicated hemorrhoids ***(El Nakeeb et al., 2008).***

Whilst hemorrhodiectomy has been the mainstay of surgical treatment, more recently other approaches have been employed including ligasure hemorrhoidectomy, stapled hemorrhoidopexy, and Doppler-guided hemorrhoidal artery ligation. Post procedureal pain an disease recurrence remain the most challenging problems in the treatment of haemorrhoids ***(Tiernan et al., 2012).***

# Aim of the Work

To evaluate retrospectively the outcome of Doppler-guided hemorrhoidal artery ligation in the management of symptomatic hemorrhoids.

# REVIEW OF LITERATURE

## Applied Anatomy of Anal Canal and Hemorrhoids

The anal canal is about 2.5–4 cm in length and encircled with anal sphincter complex. The subepithelial space of the anal canal is uneven. There are prominences of anal mucosa, known as "analcushions" – formed by loose connective tissue,smooth muscle, arteriole, venule, and anorectal vascular plexus (hemorrhoidal plexus). The formation of anal cushions is evident since the late stage of fetal development ***(Morgado et al., 1988).***

The functions of anal cushions are to maintain anal continence and to allow greater anal distension during defecation. As anal sphincter complex cannot completely close the lumen of anal canal, the presence of anal cushions is essential to fill the gap within the sphincter ring thus resulting in complete fecal continence. Physiologically, anal cushions contribute about 15% of resting anal pressure ***(Lestar et al. 1989).***

When defecating, external anal sphincter muscles relax and allow decongesting vascular plexus within anal cushions. Anal cushion is supported by an arrangement of fibroelastic tissue and anal subepithelial smooth muscle. This subepithelial smooth muscle, known as the mucosal suspensory ligament or Treitz's muscle, is the continuity of outer longitudinal muscle

fibers of the rectum passing internally and caudally through the internal anal sphincter to form a supporting framework of the submucosa vascular spaces ***(Loder et al., 1994).***

Within each anal cushion, there is an anorectal vascular plexus formed by direct arteriovenous communication between the terminal branches of superior, middle, or inferior rectal arteries and their corresponding veins ***(Aigner et al., 2009)*** (Fig. 1).

Within anorectal vascular plexus, there are several sphincter-like structures formed by a thickened tunica media of venous vessels containing 5–15 layers of smooth muscle cells which facilitate venous drainage ***(Aigner et al., 2009).***

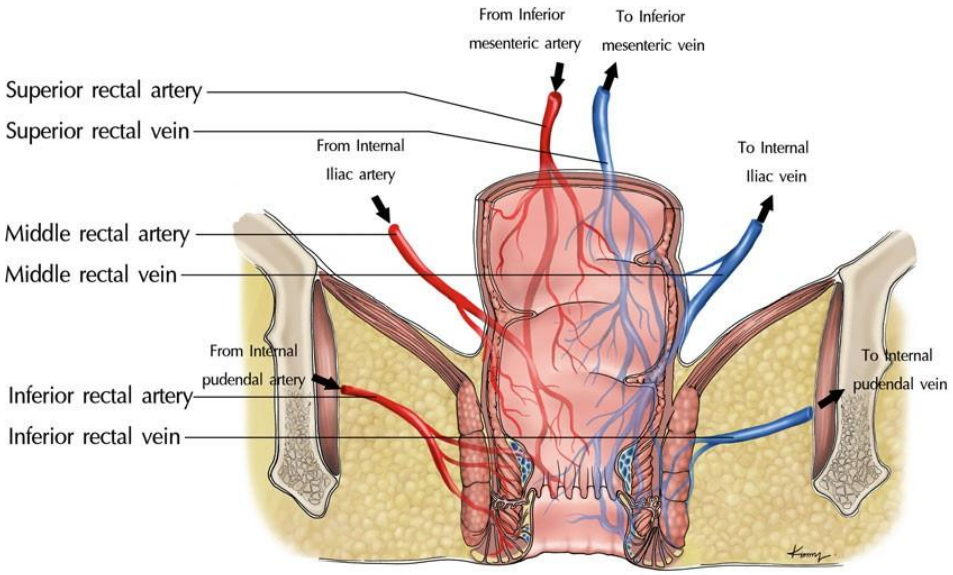


**Fig. (1):** Anatomy of anorectal vasculature ***(Lohsiriwat, 2015b).***

Typically, there are three major cushions located in right anterior, right posterior, and left lateral aspect of the anal canal. However, there could be a various number of minor anal cushions lying between them ***(Lohsiriwat, 2012)*** (Fig. 2).

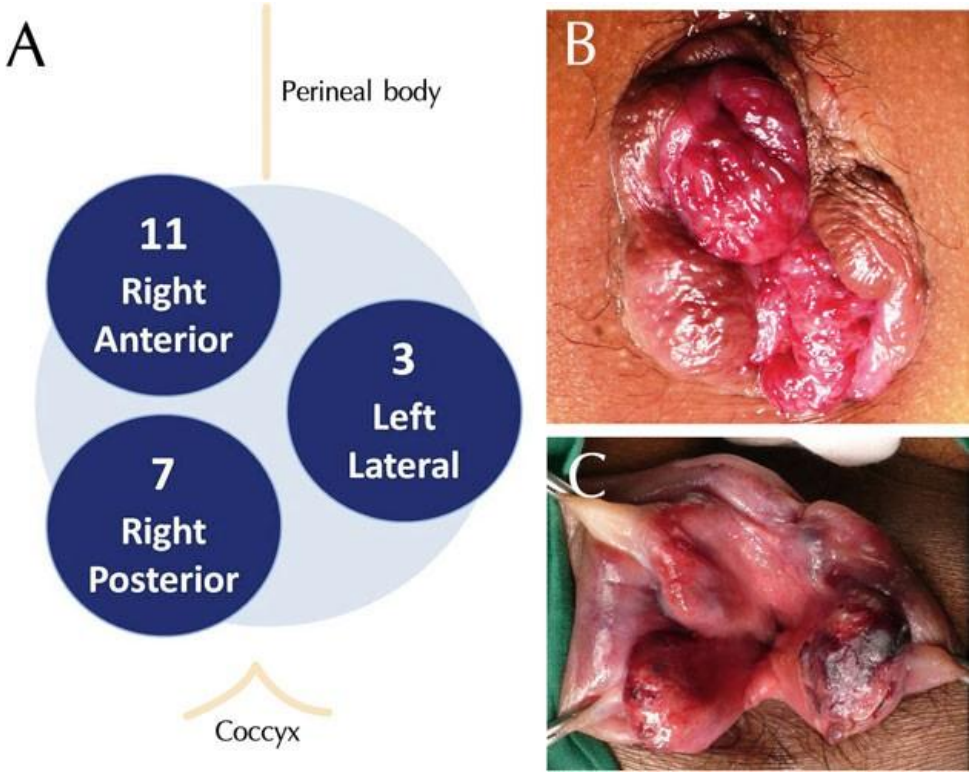


**Fig. (2):** Diagram of common sites of major anal cushions (a) and internal hemorrhoids; (b) and (c) two examples of hemorrhoidal cushions locations ***(Lohsiriwat, 2015c).***