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CAIRO UNIVERSITY - FACULTY OF MEDICINE

Results Of Treatment Of Chronic Mesenteric Ischaemia By Retrograde Aorto-Mesenteric Bypass

A THESIS SUBMITTED

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In
Partial fulfillment of the Requirements of the Master Degree (M.S.) in General Surgery

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Faculty of Medicine
Cairo University
2012

Acknowledgements

First and foremost, my deepest praises are due to Almighty ***"ALLAH"*** *Who enabled me to finish this piece of work appropriately.*

I would like to express my deepest gratitude and deep thanks to Prof. ***Magdy Haggag*** *, Professor of vascular and general surgery, Faculty of Medicine, Cairo University to whom I had the privilege to work this work under his supervision.*

I would like to offer my deepest thanks to Dr. ***Maher Abd EL Monem,*** *lecturer of vascular and general surgery , Faculty of Medicine, Cairo University for his close supervision and valuable advice. With his support, dedication and perseverance, this work was produced*

I am very grateful to Prof. ***Ahmed El Beshry*** *Professor of vascular and general surgery Faculty of Medicine, Cairo University for his help and fatherly attitude.*

Finally, I would like to express my infinite gratitude and my deepest appreciation to my family,and my wife for their support.

Abstract

Chronic mesenteric ischemia (CMI) is an area of diagnostic and surgical challenge. Surgical management remains the standard line of treatment. The ideal bypass technique and conduit type carry a lot of debate. Using autogenous vein as a conduit in such cases carries the drawback of kinking and hence, threatening graft patency.

The study evaluated surgical revascularization of CMI done by retrograde aortomesenteric bypass using a conduit of autogenous saphenous vein graft. Multislice CT angiography (MSCTA) was the radiological modality of choice in preoperative diagnosis and postoperative technique evaluation.

In a retrospective study, ten patients presenting with CMI mainly due to atherosclerotic steno-occlusive disease of both celiac and superior mesenteric arteries (CA & SMA) are included (3 females and 7 males with age range from 42 to 67 years). Associated vascular diseases were infrarenal abdominal aortic aneurysm (AAA) in one case and previous vascular intervention as occluded celiac stents in 2 cases and aortobi-iliac bypass graft in one case. Diagnosis was confirmed by MSCTA. All patients were prepared for retrograde aortomesenteric bypass using saphenous vein graft. The graft passes in front of the left renal pedicle high up to come in an antegrade fashion to the SMA; (a simplified French technique) where the graft passes in front instead of behind the left renal pedicle. As the graft course passes in different planes and directions, MSCTA was routinely done postoperatively to evaluate the technique, graft patency, and possible postoperative vascular complications.

Key Words :

Celiac Artery - Superior Mesenteric Artery - Multislice CT-angiography

List of Contents

List of Abbreviation

CA	**Celiac Artery**
CMI	**Chronic Mesenteric Ischaemia**
IMA	**Inferior Mesenteric Artery**
MSCTA	**Multislice CT- angiography**
SMA	**Superior Mesenteric Artery**

List of Tables

List of Figures

INTRODUCTION

Chronic mesenteric ischemia (CMI) is a life threatening problem that can result in death from inanition or bowel infarction. Fortunately the prevalence is low, and it has been estimated that only about 340 open revascularizations for chronic mesenteric ischemia are performed annually in nonfederal hospitals throughout the United States.

The treatment of patients with chronic mesenteric ischemia has evolved over the past several years, paralleling improvements in imaging and an increased emphasis on endovascular or less invasive treatments. Unfortunately there has been little progress with regard to the open surgical approach and our overall understanding of the underlying pathophysiology. Indeed, many of the issues debated during the 1980s and 1990s (e.g., type of open procedure, number of vessels to be revascularized) remain unresolved. Despite these limitations, it is incumbent on vascular surgeons to expedite the diagnosis and treatment of patients with chronic mesenteric ischemia owing to the severity of the underlying problem and the frequency of diagnostic delay before referral**.(Derrow et.al,2001)**

Chronic mesenteric ischemia is a relatively uncommon syndrome characterized by post prandial abdominal pain that leads to a fear of food and to weight loss. If progressive, it can eventually lead to acute ischemia and bowel infarction. A chronic progressive course may lead to severe negative nitrogen balance, inanition and death. Other manifestations may include bouts of diarrhea and chronic intermittent abdominal pain. Mortality of untreated mesenteric ischemia is in the range of 60 to 80%. The syndrome is characterized by ostial atherosclerotic stenotic disease or occlusion.The clinical sequelae results from the loss of oxygen supply to the tissues. Because the symptoms may not be characteristic, there is often a delay in diagnosis**.(Gray&Sullivan,2001)**

Endovascular revascularization in CMI was primarily indicated for elderly and high risk patients, its margin has been extended to include more patients with the emergence of more precise devices and resultant lower morbidity and mortality. However, it still has its limitations of recurrence and restenosis rates keeping open revascularization as the best treatment option owing to its durability and efficacy **(Timothy et.al,2009)**

Mesenteric bypass either antegrade from the supraceliac aorta or retrograde from the infrarenal aorta (or common iliac artery) are considered as the most common surgical options and each has its advantages. Prosthetic and autogenous conduits have been used in various mesenteric bypass procedures, although reports comparing the long-term patency rates for the two different conduits have been inconclusive **(Modrall et.al, 2003)**

The use of venous grafts as a conduit carries a higher patency rate and resistance to infection compared to synthetic ones. However, they carry the risk of kinks and restenosis especially when used in retrograde bypasses. In such bypasses, the obligatory course of the graft transiting from the aorta in the retroperitoneum to the moving SMA sitting anteriorly at almost 180º turn raises a higher potential for kinks and consequently graft occlusion **(Modrall et.al, 2003)**Owing to this drawback, different techniques have been proposed to muffle the possible kink of the vein graft and to give it the enough length to adapt to movements of the SMA **. (Jean-Paseal et.al, 2001)**

Retrograde aortomesenteric bypass using synthetic or saphenous vein graft passes behind the left renal pedicle (French Technique) is a good type of bypass for treatment of CMI. It requires retroperitoneal dissection and carries the risk of kinks, rotation, and postoperative hematoma and infection **. (leschi et.al, 2001)**

Aim of work

In this study a simplified technique was used in a similar way to that of French technique but the graft passes in front instead of behind the left renal pedicle. Graft is seen during the whole procedure to avoid kinks and without retroperitoneal dissection. Since the graft takes special course and passes at different planes and directions, Multislice CT-angiography (MSCTA) is the chosen modality to assess the bypass procedure especially after abdominal closure. Image analysis and multiplanar reformat help to depict graft course and diagnose any kinks at different sites. Moreover, graft patency and postoperative vascular complications could be discovered.

ANATOMY

Anatomical consideration (Fig 1) :

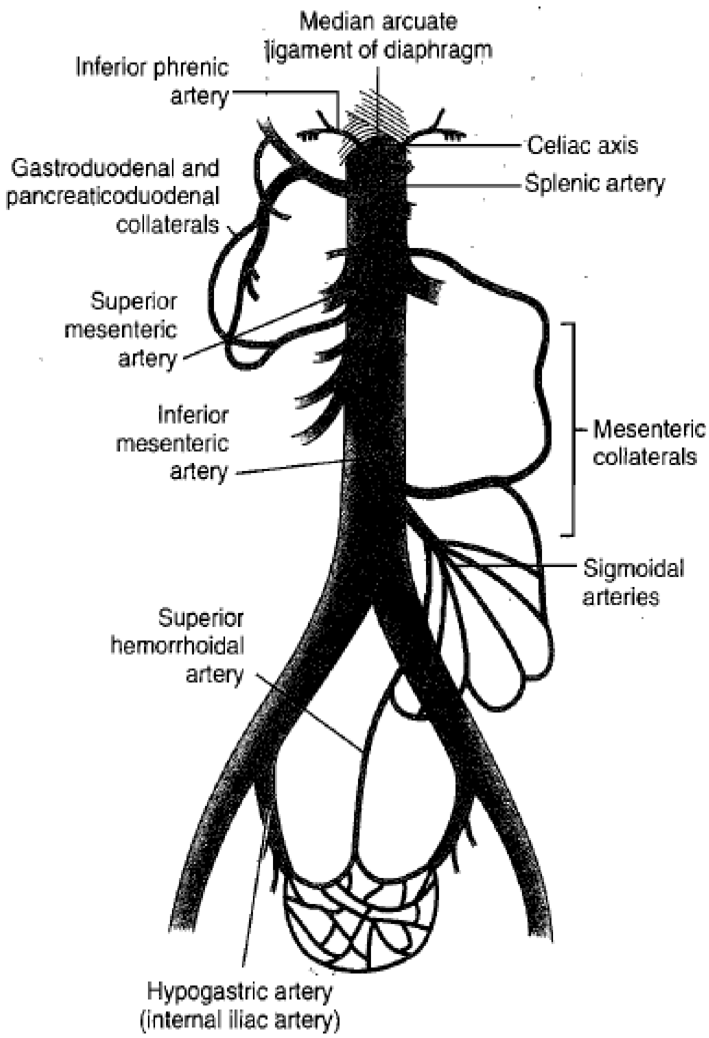

Fig 1 Diagram of collateral pathways for the mesenteric vessels. The celiac axis and superior mesenteric arteries communicate through the superior and inferior pancreaticoduodenal arteries, respectively. The superior and inferior mesenteric arteries communicate through the meandering artery and the marginal artery of Drummond, with the former serving as the dominant collateral. The inferior mesenteric artery communicates with the internal iliac artery through the hemorrhoidal vessels.
(Zelenock., 2001.)

The classic dictum for symptomatic CMI is involvement of at least two of the three mesenteric arteries: the celiac (CA), the superior mesenteric artery (SMA) and/or the inferior mesenteric artery(IMA). However, based on perhaps the largest ongoing study on CMI (locally at Swedish Medical Center/Providence campus),symptomatic CMI can occur in significant SMA stenosis with intact CA & IMA. With significant obstruction, common arterial collateral pathways develop. These include:

1. Arc of Riolan-principal pathway between proximal branches of the IMA and the SMA;
2. Marginal artery of Drummond-connections between the distal branches of SMA & IMA;
3. Arc of Barkow: SMA & gastroepiploic artery connections;
4. Arc of Buhler: Persistent embryonal ventral anastomoses**.(Parikh et.al, 20002)**

The superior mesenteric artery (SMA) supplies the midgut **(Sinnatamby**, **2006)**This is the portion of the digestive tract extending from the duodenum at the opening of the bile duct to the junction between the right two-third and left one-third of the transverse colon**.(Moore & Dalley, 2006)**

This midgut derivatives includes; the small intestine including the duodenum inferior to the opening of the bile duct; the caecum, appendix vermiformis, ascending colon and the right two-third of the transverse colon **.(Moore & Persaud,2004) (fig1a)**

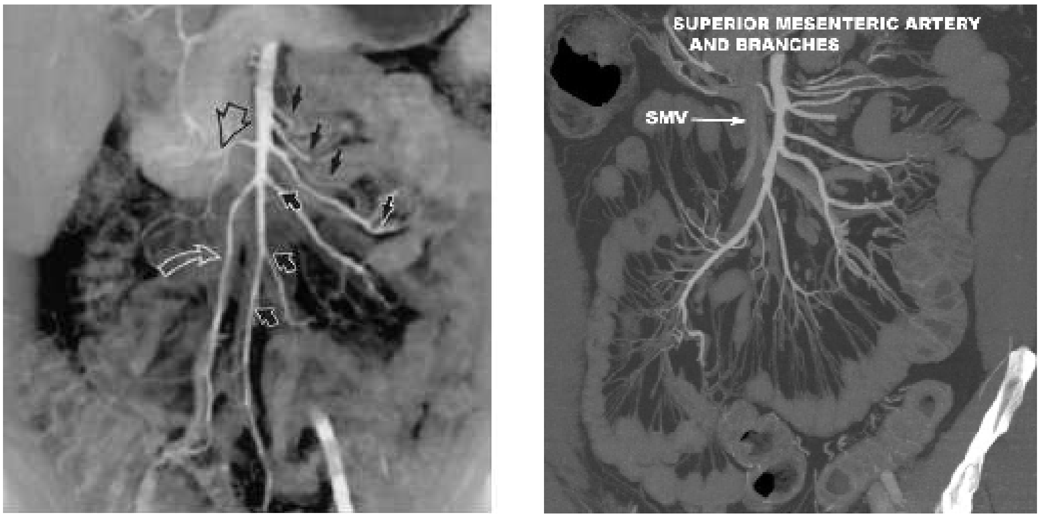

Fig1a Coronal 3D multi– detector row CT scan demonstrates the normal anatomy and branching pattern of the SMA. The jejunal branches (straight solid arrows) and ileal branches (curved solid arrows) are well visualized. The ileocolic branch of the SMA arises from the right side of the vessel (curved open arrow).The middle colic artery is also identified (straight open arrow**) (Rosenblum et.al,1997)**

The SMA which supplies this portion of the gut with oxygen-rich blood arises from the anterior surface of the abdominal aorta one centimeter below the ceoliac trunk at the level of the lower border of L1 vertebra. It is directed steeply downwards entering the upper end of the mesentery of the small intestine down to the right along the root of the mesentery to the ileocaecal junction. **(Sinnatamby, 2006)(fig1b)**

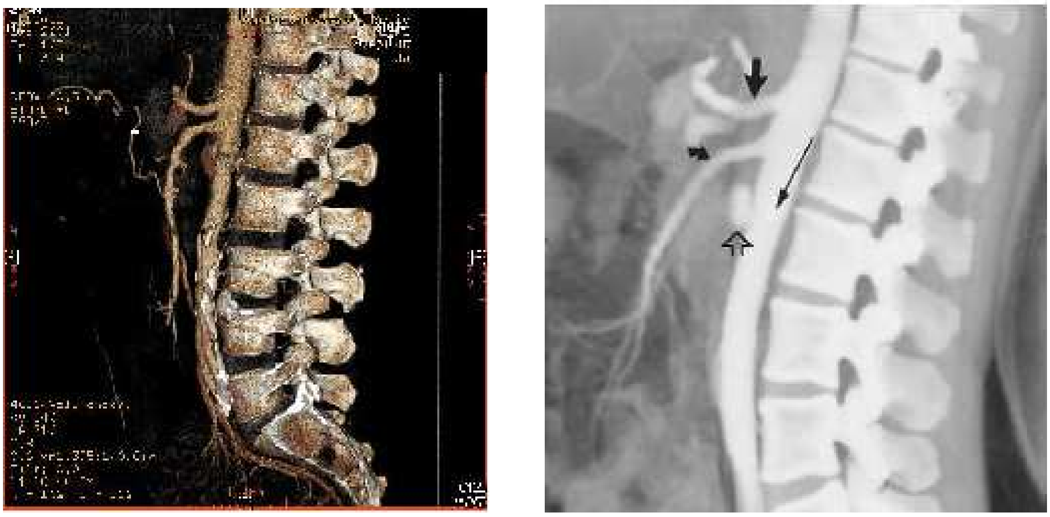

Fig1b Sagittal 3D multi– detector row CT scan demonstrates the normal anatomy of the celiac axis(thick solid arrow) and SMA (curved arrow). The SMA courses over the left renal vein (open arrow). The origin of the left renal artery is also visualized (thin solid arrow) **(Kornblith et.al, 1992)**

The artery gives off several branches which include; the inferior pancreaticoduodenal artery (from the posterior surface), jejunal and ileal branches from the left surface, and ileocolic, right colic and middle colic branches from right surface.**(Sinnatamby,2006**).Variations in the branching and distributions of the SMA and other vessels are common **.(Nelson et.al, 2006**)

In about fifty percent (50%) of cases, the marginal artery which is a result of the anastomosis of the branches of the SMA and inferior mesenteric artery (IMA) may be discontinuous because of the failure of the anastomosis between the left and the right colic arteries. **(Basmajian, 1980).**

The right colic artery may originate from the middle colic or ileocolic arteries, and a large branch, the Arc of Rioland, may occasionally connect the stem of the SMA with the left colic artery on the posterior abdominal wall . **(Lange et al, 2007)**

There have been reports of cases where the right and middle colic arteries were absent leaving the entire supply of the colon to the IMA .In other variations, the hepatic or accessory hepatic and cystic arteries have been reported to arise from the SMA either alone or together**.(Jones& hardey,2001).**In rare cases the IMA has also been reported to arise from the SMA either alone or along with the hepatic artery. **(Yi et al., 2008).** The right gastroepiploic artery has also been reported to arise from the SMA. **(Sakamoto et al., 1999).**

Aberrant branches from the SMA are relatively common **(figs1c,1d)**. They include the common hepatic artery, right hepatic artery, splenic artery,celiac trunk, cystic artery, gastroduodenal artery, right gastroepiploic artery, and left gastric artery**.(Katagiri et al., 2006).**