

## **GASTROINTESTINAL FISTULAE: LETHAL IMPLICATIONS REMAIN**

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### **Summary**

Gastrointestinal fistulae are potentially catastrophic conditions, which continue to be associated with an appreciable mortality. The purpose of this review is to identify the latent lethal factors of those conditions in an attempt to control them. This review demonstrates that invasive sepsis continues to be the most likely cause of mortality. This was found to be closely followed by malnutrition which, in turn was rendered difficult to reverse in the presence of undrained sepsis. Nonetheless malnutrition alone can also be a determinant of mortality. The third cause of mortality may follow a failure to properly correct fluid and electrolytes imbalance. This factor should not remain an appreciable lethal factor, given the monitoring capacity, and the associated means to correct such imbalances, which should be

available in all modern hospitals.

With the above understanding; the successful treatment of fistulae demands the following:-

1. Proper use of fluid and electrolyte replacement.
2. Nutritional support.
3. Proper diagnosis of the fistulae on the basis of their etiology, pathology and anatomical locations.
4. Control of sepsis by radiological assisted methods or open surgical techniques and/or by the use of appropriate antibiotics.
5. Surgical treatment of fistulae resistant to spontaneous closure after the optimal use of supportive management.

### **1. Definition**

A gastrointestinal fistula is a term used to describe an abnormal communication between the gastrointestinal tract and the body surface. It also describes an abnormal passage that connects one segment of the gastrointestinal (GI) passage to another segment of the same system. The term could also be used to describe a pathologic connection with other organs or tracts such as found with fistulae that may connect the GI tract with the ureters, the bladder, or the pleura.

It may help to recall that, from an anatomical standpoint, the GI tract may be described as a musculomebraneous tube that extends from the mouth all the way to the anus. It is lined by a mucous membrane that has developed from the endoderm of the developing fetus.

### **2. Historical notes**

There is a paucity of notes on the subject of GI fistulas in antiquity, although documentations exist on the presence of urinary fistulae in Egyptian women such as was found in the mummy of a woman who lived in the eleventh dynasty, around 2050 B.C.

The most plentiful records on fistulas in antiquity are the perianal varieties of such conditions. This is so, possibly because such conditions are not known to be fatal and are amenable to both proper management and accurate description. We thus have evidence of the recognition of the existence of perianal fistulation, with a description that goes back all the way to Hippocrates (c.460-377 BC), the Greek physician of antiquity whose name is still called upon today in the oath that carries his name.

Later in the history of surgery, we find that the proper treatment of such indolent fistulae, on a great French king, helped to raise the status of surgeons to a professional standing not enjoyed before. The King in question was Louis XIV of France, known to posterity as the Sun King. But that exalted status did not immunize Louis' royal anal canal from developing a fistula. Thus in 1687, "the French Surgeons had a lucky break", when one of them, C.F. Felix (1650-1703) was called in to operate on the king. "Felix's success earned him an estate and 300,000 livres".

Reports on post operative fistulae are not as plentiful in pre-modern history, as they are

today, possibly because these usually follow surgeries that became feasible only after the introduction of general anesthesia in the middle of the 19<sup>th</sup> century. Also war related reports of intestinal injuries must have led to early mortality, giving no time for fistulae to develop. And yet fistulas must have developed as a result of shot gun injuries, and we have a US army surgeon, named William Beaumont (1785 – 1853), to thank for recording such a fact. In 1822 he was called in to treat a 19 years old trapper, named Alexis St. Martin, who was recovering from a gaping gun shot wound of the abdomen that left him with a permanent gastro-cutaneous fistula. Both patient and surgeon have found a lasting *place in the books of physiology, as a result of the studies on gastric juice that Beaumont* carried out on his patient and which he published in 1833 .

With the advent of modernity, which came with a more accurate appreciation of anatomy, and with a better knowledge of pathology; the existence of *internal* fistulae started to be recognized in the second half of the 19<sup>th</sup> century. Thus Murchison was possibly the first to report on the condition of spontaneous gastrocolic fistula. The recognition of the pathogenesis of diverticulitis permitted Sidney Jones to recognize the entity of vesicocolic fistula as a complication of colonic diverticulitis .

Other than progress in pathology, entrance in the 20<sup>th</sup> century came with new diagnostic modalities, such as the availability of radiological techniques..

What is impressive is how early, in the course of history, was the recognition of the effect of nutrition on the outcome of GI fistulae. Thus, as early as 1858, Wilhelm Busch proceeded to improve the nutrition of a woman suffering from a jejunal fistula complicated by malnutrition. He achieved this by constructing a feeding jejunostomy and giving his patient a high caloric and high protein diet. It thus became clear that the stomach is not necessary for digestion, since his patient gained 19lbs. As a result; as noted by Josef Fischer, feeding jejunostomy was soon adopted in Europe. More than half a century later, Clark recognized the positive effect of nutrition on healing and on the closure of fistulae. But, following this study, and despite the sporadic calls that were made in a series of publications, the nutritional factor was by and large neglected by the surgical establishment in the US.

### 3. Classification

#### 3.1. From an anatomical standpoint; GI fistulas are traditionally classified as internal or external.

- i- Internal fistulae are defined as a communication between two or more loops of the GI tract. Alternatively it may indicate a communication between a segment of the GI tract and another organ such as the lung or pleura. Such fistulas are difficult to manage and rarely if ever close spontaneously.
- ii- External fistulae are clearly visible to the examiner since they connect a segment of the GI passage to the skin, and are thus called “Enterocutaneous”. In contrast to internal fistulas, the external varieties may be expected to heal spontaneously.

At the same time such conditions are also described as lateral or end fistulae, depending on

their relation to the fistulation of the diseased viscus. Thus a controlled duodenal stump fistula is a form of end fistulae.

### 3.2. Classification based on the loss of fluid, electrolytes and proteins.

Because such losses are linked to prognosis, the fluid output has been conveniently used to classify fistulae into:-

- a-High- output (>500 ml/day)
- b-Moderate-output (200-500 ml/day)
- c-Low output ( < 200ml/day)

### 3.3. Classification according to etiology.

This will be reviewed when the etiology of fistulae will be examined.

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### Bibliography

Adams, F.: *The genuine work of Hippocrates*. Williams and Wilkins, Baltimore 1939[A reference work useful to identify how far back in antiquity has the condition of fistulae been appreciated].

Aird, I.: *A Companion of Surgical Studies*. E.S. Livingstone 1957.[The late Mr. Aird was the Professor of Surgery at the Royal Post Graduate School of Medicine, Hammersmith Hospital, London. His book was a standard text book of Surgery for many years. The author credited Sidney Jones for recognizing that diverticulitis may be complicated by the formation of colo - vesical fistulae.]

Clark, A.H.: *Effect of diet on the healing of wounds*. Bull. John Hopkins Hospital, 30; 117, 1919. [An early study on the importance of nutrition in the healing of wounds, which took sometime to be universally followed.]

Denzinger, S., Lars, L., Burger, M., Wieland, S., & Otto, W.: *Vacuum Assisted Closure therapy in uretero-ileal anastomotic leakage after surgical therapy of bladder cancer*. World Journal of Surgical Oncology, 5: 41, 2007[A well written report on the technique and applicability of VAC in urinary fistulae. Preliminary experience with this system has documented its applicability also in cases of entero-cutaneous fistulae.]

Edmunds, L.H., Williams, G.M., & Welch, C.E.: *External fistulae Arising from the Gastrointestinal Tract*. Annals of Surgery, 152; 445, 1960. [This study was incorporated in that of Soeters et al, as the first of three periods that witnessed the evolution of gastrointestinal fistulae's morbidity and mortality in one institution: The Massachusetts General Hospital of Boston Mass.]

Evenson, A.R., & Fischer, J.E.: *Current management of enterocutaneous fistula*. The Society for the Surgery of the Alimentary tract. Vol.10, No.3, 2006 [An authoritative and comprehensive review; co-authored by Dr. Josef E. Fischer who is a widely recognized pioneer in the science and clinical applicability of surgical nutrition.]

Fazio, V.S., & Coutsoftides, T., & Steiger, E.: *Factors Influencing the outcome of Small Bowel Cutaneous Fistulae*. World Journal of Surgery. 7: 481, 1983 [A classical paper, authored by one of the pioneer of colorectal and intestinal surgery. It is often quoted for its findings on the factors that affect surgical healing. This is also the paper that described the entity of obliterative peritonitis.]

Fischer, J.E.: *The Pathophysiology of Entero cutaneous fistulas*. World Journal of Surgery. Vol. 7 . No.4, July 1983 [Given his authoritative recognition, J.E. Fischer promoted in this paper the five stages of management reported in this review of gastrointestinal fistulae.]

Kamel, R.: *Gut Fistulae*. In Kamel, R & Lumley, J.: Textbook of Tropical Surgery. p.1276, Westminster Publishing Ltd., London 2004. [This Textbook was referred to in order to offer a perspective of fistulae in tropical countries.]

Madden, J.: *Segmental Resection for Acute and Chronic Diverticulitis*. P.70 in: Nyhus, L. & Baker, R.: *Mastery of Surgery*, Little Brown & Co. Boston, 1984. [Technical advices on the surgical treatment of colovesical fistulae, offered by a “Master Surgeon”.]

Mahfouz, N.: *Urinary Fistulae in Women*. The Journal of Obstetrics and Gynaecology of the British Empire. Vol. LXIV, No.1, p.23 Feb.1957 [This article describes in some details a vesico-vaginal fistula in an Egyptian mummy. It also describes the surgical technique to manage it.]

Murchison, C.: *Case of Gastrocolic fistula with observation on pathology, diagnosis etc*.Edin.Med.J.3:121, 1857. [The interest in this old article stems from it being possibly the first report on a spontaneous gastrocolic fistula.]

Ostrow, B.: *Acquired Gastrointestinal fistulae*. Surgery in Africa Monthly Review, www.utoronto.ca , 2006. [A well documented review on the subject of gastrointestinal fistulae, but with only little information on the Indian and South African experiences.]

Ottinger, L.: *Small Bowel Fistulae*. In Morris, P., and Malt, R.: Oxford Textbook of Surgery. p.981. Oxford University Press, Oxford, UK 1994. [Standard Surgical Text written by authoritative experts on both sides of the Atlantic.]

Porter, R.: *The Greatest Benefit to Mankind*. P.279, W.W. Norton & Co, NY.1997 [This book recounts in vivid details the evolution of Medicine as an art and a science from antiquity to modernity.]

Rosemack, S. & Hollander F.: *Surgical Jejunostomy, A Historical Review*. Clinics 3, 111: 638, 1944. [This paper is interesting because it documented a 19<sup>th</sup> century appreciation of the importance of nutrition in the healing of a post traumatic jejunal fistula that refused to heal. The case presented showed that as a result of constructing a feeding jejunostomy, a surgeon by the name of William Busch, was able in 1858, to achieve his goal by using a high protein high caloric diet through the feeding jejunostomy. As a result the patient was also shown to have gained 19 lbs after 21 weeks of enteral feeding.]

Rots, W.I., Mokowena, T.: *Successful endoscopic closure of a benign gastrocolic fistula using human fibrin sealant through gastroscopic approach. A case report and a review of the literature*. European Journal of Gastroenterology. 15 (2): 1351, 2003 [An article that could be of interest to a clinician who may have found an appropriate indication, (and a willing patient), for the use of this method.]

Soeters, P.B., Ebeid, A.M., & Fischer, J.E.: *Review of 404 Patients with Gastrointestinal Fistulas. Impacts of Parenteral Nutrition*. Annals of Surgery, vol.190, No.2 p.189, 1979 [This extensive review of patient in one institution, revealed that gastrointestinal fistulae remain potentially lethal conditions, despite the frequent use of “hyperalimentation”. The study has shown very clearly that TPN can only be effective in the absence of deep sepsis. In other words; any evidence of sepsis need to be vigorously addressed with proper diagnostic and surgical approach.]

Wang, X., Ren, J., Li, J. et al. : *Closure of Gastrointestinal Fistulas using Fibrin Sealant under Fistulography* . International Surgery, 90 (4) 223 , Oct.2005 [This study shows a different way of using fibrin sealant, than the technique utilized by Rots & Mokowena.]

Welch, C. & Rodky, G.: *Method of Management of Duodenal Stump after Gastrectomy*. Surg. Gynecol. Obstet. 98: 376, 1954. [A classic work, still called upon to justify the use of a catheter duodenostomy after a Billroth II type Gastrectomy. This policy followed the highly successful demonstration that the liberal use of the Welch and Rodky’s catheter duodenostomies, at the MGH, has been considered responsible for the significant decreased incidence of post-gastrectomy fistulae, and their associated mortality at this institution.]

## **Biographical Sketch**

**Amin Makram Ebeid**, FRCS.,FACS. Diplomat of the American Board of Surgery.

Amin Makram Ebeid received his medical education at the University of Cairo, Egypt. He was licensed as a physician in 1963, after completing his Internship at Cairo University hospitals. He completed his residency in General Surgery and Gynaecology, at the Coptic Hospital in Cairo in 1966, at which time he was appointed Assistant Surgeon at Kitchener's Memorial Hospital after obtaining the necessary Diploma of Surgery.

In 1968 he was appointed House Officer at the Hammersmith Hospital in London. His surgical training was then pursued at the Royal Marsden Hospital in London in the capacity of Senior House Officer. In 1970 he was offered a studentship in Surgical Pathology at the Royal Marsden. In January 1970 he became a Fellow of the Royal College of Surgeons. This permitted him to complete his surgical training in England as a Registrar in General Surgery at Plymouth General Hospital (Greenbank).

Equipped with the above training and surgical degree, he returned to Egypt, in 1972 and joined the Mansoura University Hospital as a faculty member and attending surgeon.

In January 1975 he joined the Massachusetts General Hospital (Harvard Medical School, Boston, Mass) as a Clinical and Research Fellow. In 1977 he was upgraded in the same institution as Clinical Assistant in the Surgical Service.

In July of the same year (1977) he joined New Britain General Hospital (University of Connecticut), as a Resident in surgery. After completing his "Chief Resident" year of the residency program, he was given the responsibilities of a teaching Resident, which lasted till the end of 1980.

In 1981 he became a diplomat of the American Board of Surgery.

Following this certification he established, in 1982, a solo practice in General Surgery in the Houston area of Texas. Then in 1990 he co-founded the Coastal Surgical Group with Dr. A. Hadad. Soon after; the group was extended to include a total of six surgeons.

He retired from private practice in Nov.2003.

His published research include studies that were carried out in the fields of Gastro-Entero-Pancreatic peptides and hormones, malignant melanomas, hepatic encephalopathy, GI fistulae, inguinal hernia repair, a study on the banding of a PTFE hemodialysis fistula, complications of laparoscopic surgeries.