Major Changes in Urine Investigations after Orthotopic Cystectomy with Ileal Neobladder

Thesis

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بسم الله الرحمن الرحيم

قالوا

سبحانك لا علم لنا
إلا ما علمتنا إنك أنت
العليم الحكيم

صدق الله العظيم

سورة البقرة الآية: ٣٢

List of Contents

Title	Page No.

List of Tables

List of Figures

List of Abbreviations

Abb.	Full term
CIC	*Clean Intermittent Self-Catheterization*
NaCl	*Sodium Chloride*
OBS	*Orthotopic Bladder Substitution*
PTH	*Parathyroid Hormone*
SMA	*Superior Mesenteric Artery*

ABSTRACT

The study included 100 patients underwent orthotopic neobladder and followed up of more than 6 months with good uncomplicated functional and oncological outcome, urine samples were obtained and extensively analyzed including physical, chemical and microscopic examination.

The results showed that; the urine analysis in clinically normal diverted patients showed higher urine pH than in the control group but it still acidic. Pyuria, proteinuria, hematuria and positive culture were significantly higher in diverted patients. The urine excreted through the ileal segment when compared with control samples show no significant changes in urine output volume and also showed lower urinary calcium, sodium, potassium and chloride contents. There were no any significant differences between both groups of diverted patients as regard urine or blood analysis.

Keywords: Sodium Chloride - Parathyroid Hormone - Superior Mesenteric Artery

INTRODUCTION

First line of surgical treatment for the muscle invasive and refractory superficial bladder neoplasia is radical cystectomy ***(Ghoneim and Abol-Enein, 2008: Stein et al., 2001)***.

After orthotopic cystectomy, the urinary diversion must be done. Variety of options has been suggested for the usage of the intestine such as: urinary conduits, ureterosigmoidostomy, orthotopic bladder substitution (OBS), continent cutaneous diversion ***(Hendren, 1997)***.

The most commonly used technique of urinary diversion after radical cystectomy nowadays is Ileal neobladder since its introduction at 1959 by (Camay). Previously, it was Bricker conduit ***(Hautmann et al., 2007)***.

At comparison colon has less compliance than ileum, which in turn has lower contractility with minimum metabolic complications (as far as Vit. B12 deficiency & megaloplastic anemia) so it has the upper hand in the favoritism of the urologists ***(Schrier et al., 2005)***.

Modification for the best ileal neobladder must have 2 criteria: detubularization & double folding of least possible length that sustain the largest size & least pressure system ***(Berglund et al., 1986).***

Even though complexity & the length of operation of ileal neobladder, it is very safe with not more than 2% mortality and the outcome has the least altered parameters of lifestyle ***(Abol-Enein and Ghoneim 2001)***.

Ileal neobladder is convenient for the majority of the patients, only has few contraindications: renal impairment, hepatic problems, intestinal diseases & mental impairment ***(Hautmann et al., 2007).***

Studer Ileal OBS has been described in 1988, the usage of 54-60 cm on detubelarized late ileum to create a global pouch which will be surgically connected to the urethra. For the first 15 cm of the isolated limb, the ureterointestinal anastomosis is performed. The Studer orthotopic neobladder has proved great performance as a choice for storage of urine, upper tract preservation & efficient voiding, with reasonable reported rate of complications, reoperation and continence ***(Studer et al., 1995).***

In 2001 Abol-Enein H. & Ghoneim Ma reported a modification of Hautmann W neobladder in which they reconfigure the pouch to render it to receive their invention of a serous-lined extramural tunnel as an anti-reflex procedure for ureteroileal anastomosis. They fashioned the neobladder from only 40 cm ileum in spherical-configuration which results in high functional outcome, efficiency and durability ***(Abol-Enein and Ghoneim 2001).***

Bowel segment differ from relative urothelium, exposure of bowel segment to the urine results in exchange of water and solutes across intestinal mucosa due to its absorptive and secreting properties. This mechanism may alter the volume and composition of the urine when stored in the reservoir for a time. These urinary changes result in multiple short and long term sequels and changes in both the urine composition and serum ***(Akurlund et al., 1989).***

Urinary and metabolic changes differ in its severity and consequences. The severity of these changes is directly related to the type of bowel segment, surface area of bowel used, duration of urine storage concentration of solutes in urine, urinary ph and osmolarity, medications and underlying renal and hepatic function of the host ***(McDougal, 1992).***

Aim of the Work

The standard physical, chemical and biological composition of the ileal reservoir urine is not adequately addressed in English literature.

Many urologists still use the standard known facts of the normal urine characteristics and take a therapeutic decision on the finding in reservoir urine which is not correct.

The primary outcome is to characterize the physical, chemical and biological characters of urine in patients underwent radical cystectomy with ileal neobladder and these could be utilized as a nomogram to which urine disorders in diversion patient is compared.

Chapter 1

PHYSIOLOGICAL ROLE OF THE ILEUM IN ABSORPTION, SECRETION AND MUCUS PRODUCTION

I. some anatomical consideration:

Ileum is a specialized tubular structure that represents the third part of small intestine. It lies in continuity with the jejunum proximally and the colon distally at the ileocecal valve. Ileum is positioned in the right abdomen and upper part of the pelvis, suspended within the peritoneal cavity by a thin, broad-based mesentery that is attached to the posterior abdominal wall and allows free movement within the abdominal cavity ***(Petras, 2013).***

II. Microscopic features:

The small intestine has four tissue layers: the serosa, muscularis, submucosa and mucosa. The serosa is the outermost layer of the intestine; it is a smooth membrane consisting of a thin layer of cells, which secrete serous fluid. The latter is a lubricating agent which reduces friction from the movement of the muscularis. The muscularis is a region of muscle adjacent to the submucosa. It is responsible for gut movement or peristalsis. The submucosa is the layer of a dense irregular connective tissue that supports the mucosa, as well as joins the mucosa to the bulk of underlying smooth muscle. The mucosa is the innermost tissue layer of the small intestines; it is formed by glandular epithelium, lamina propria and muscularis mucosa. The glandular epithelium is composed of various cell types that include a columnar epithelium with glands called crypt of Lieberkuhn, Paneth cells (secrete lysozymes), mucus-secreting goblet cells, enteroendocrine cells (secrete hormones) and finger-like projections called villi. Intestinal villi are tiny finger-like projections that protrude from epithelial lining of the mucosa. Each villus is approximately 0.5 1.6 mm in length and has many microvilli, each of which are much smaller than a single villus. Villi increase the surface area that is available for absorption. The villi are connected to blood vessels that carry the nutrients away in the circulating blood ***(Petras, 2013).***

Intestinal epithelial cells are connected to each other by cell junctions at their lateral borders to form a continuous tight belt. The transport through these tight junctions is called paracellular transport ***(Petras, 2013).***

Small intestine is supplied by superior mesenteric artery (SMA) which arises from abdominal aorta at level of first lumber vertebrae. Multiple ileal branches arise from the left side of SMA and they anastomose with each other to form arcades. A terminal (end) branches arise from these arcades to supply the ileum, called vasa recta. Ileal arteries are accompanied by the same named veins, which drain into the superior mesenteric vein (SMV). SMV joins the splenic vein to form the portal vein to start the portal circulation ***(Singh, 2007).***

Ileum has a very rich lymphatic drainage. Ileal lymphatic system regulates tissue fluid homeostasis, promotes immune surveillance and also functions to transport luminal substances including fat. Each villus has a central lymph vessel called a Lacteal. Lymph from lacteal drained into vessels in the gut wall then to mesenteric vessels. The lymph drain then passes to hundreds of mesenteric lymph nodes then to preaortic lymph nodes. Lymphatic drainage proceeds to cisterna chyli and then via the thoracic duct into the left subclavian vein ***(Singh, 2007).***

III. Lons and solutes transportation:

Ions and solutes cross the epithelial lining by active or passive transport. Active transport occurs against chemical or electrical gradient and it is a transcellular process that requires energy. Passive transport occurs down an electrochemical gradient, does not consume energy and may be transcellular or paracellular ***(Cuppoletti and Malinowska, 2006).***

Passive solute transport occurs via exchange ports and co-transporters, which are transmembrane proteins that control solute transport across mucosal membrane driven by electrochemical gradient. Exchange ports allow charged ions to be transported for a different ion of equal charge. Neutral solutes can be co-transported with charged ion through co-transporters, when electrochemical gradient exists ***(Cuppoletti and Malinowska, 2006).***