An Innovative Wound Retractor/Protector for Prosthetic Urologic Surgery

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Key Words

Reconstruction • Retractor • Prosthesis •
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Abstract

Objective: We demonstrate an innovative use of a barrier surgical wound retractor/protector system for use in a variety of prosthetic urologic procedures (penile prosthetics, artificial urinary sphincters, male slings). **Materials and Methods:** We demonstrate the use of a self-retaining ring wound retractor in a multitude of prosthetic urological procedures: insertion of an inflatable penile prosthesis through an infrapubic approach as well as penoscrotal approach, placement of a transperineal artificial urinary sphincter, and placement of a male urethral sling. **Results:** The self-retaining ring wound retractor facilitated a more rapid setup and takedown, provided 360 degrees of atraumatic retraction as well as 360 degrees of wound protection, allowed for maximum exposure with a minimum incision size, significantly shortened the operating wound depth thus maximizing exposure, and isolated the surgical field minimizing prosthesis to skin contact. **Conclusion:** Our experience shows that prosthetic urologic surgeries can be enhanced with the use of the self-retaining ring wound retractor as it provides better surgical exposure, lowers wound infection risks, sets up more quickly as a safer retraction system with substantial cost savings.

Introduction

The annual number of prosthetic urologic procedures performed has steadily increased. For example, a review of the trend in the indication and the adoption of the artificial urinary sphincter (AUS) revealed an increased from a total of 11 cases in 1975 to over 3,700 cases performed in 2005 [1–4]. This trend may also apply to other urologic prosthetic procedures such as the placement of inflatable penile prosthesis and the male urethral sling. The major themes within the prosthetic literature include new surgical techniques, techniques for needed revision, detrimental effects of infections, the risk factors for infection, the prevention of infection with the use of hydrophilic and antibiotic-coated prostheses, and rescue procedures. In this article, we demonstrate a simple, but innovative, use of a self-retaining ring wound retractor in urologic prosthetic procedures that may impact these themes.

Material and Methods

The Alexis® wound protector/retractor (Applied Medical, Rancho Santa Margarita, CA) was utilized for patients undergoing infrapubic or penoscrotal insertion of inflatable penile prosthesis, transperineal AUS, and the perineal male sling procedures. The patients were shaved, administered broad-spectrum intravenous antibiotics, appropriately positioned, and underwent either a ten-minute scrub of the surgical site with povidone-iodine soap, or 3 separate applications of the ChlorPrep® (CareFusion, San Diego,

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CA) surgical antiseptic. The surgical fields were then appropriately draped. We prefer to use either the self adhesive drapes, or 2 surgical towels with skin staples at the level of the anus due to its close proximity to the surgical sites during the urologic prosthetic procedures. Using the provided template ring, the surgical incisions to be made were outlined using a skin marker (typically 4 cm for perineal and 3 cm for penoscrotal or infrapubic incisions) and made using a #15 blade. The wound retractor is made up of 2 rings with a cylinder of impervious plastic between them (fig. 1). We find the flexible small ring preferable for perineal cases and the extra small size preferable for penoscrotal and infrapubic penile prosthetic cases. The underlying tissue below the skin was bluntly dissected away to create a circumferential space for the inner ring of the wound retractor. The inner ring is placed within the surgical space and the outer ring is placed on the outside on the skin. The outer ring is then rolled inwardly under tension around the cylinder of impervious plastic until the plastic becomes taut circumferentially around the wound (fig. 2). Note the surgical field is isolated from contact with the immediate surrounding surface of the skin and wound edge. The ring itself is a physical barrier and keeps the rectum away from the operative field during perineal exposure. Furthermore, the operative depth shrinks as the surgeon rolls the rings closer together (fig. 3). More than one retractor can be used at different surgical sites for multiple prosthetic procedures without having to readjust from one field to another as would be required with the Scott retractors. Additionally, one surgical site can be completely isolated while another is being used by unrolling the outer ring to gain some laxity of the cylindrical plastic and then rotating them either clockwise or counterclockwise thereby effectively sealing the wound until ready for later use. We have found this retractor system to be quite versatile to all prosthetic urologic cases.

Discussion

The specialized wound retractor device is designed as a disposable, circumferential surgical retractor which provides 360 degrees of atraumatic retraction and 360 degrees of wound protection. The advantages of this type of retractor include: 1) its even distribution of force for optimal surgical field of view with a minimal incision; 2) its ability to shield and prevent the contact of the prosthesis with the skin; 3) enhanced safety that is addressed within the operating room; 4) quicker operative times and 5) substantial cost savings.

An optimal surgical field of view is achieved with this retractor system. When using a typical 4 cm incision, the working surface area is calculated to be 8 cm² using 4-point retractors. Using the formula $\text{Area} = [\pi (\text{diameter})^2] / 4$, the working surface area using the wound retractor is calculated to be 12.6 cm². This is an increase of 36% working surface area by optimizing the same 4 cm length incision. Furthermore, once the wound retractor is deployed, the unique ring holds the retractor in

place without the need for cumbersome readjustments of hooks or frames, as commonly seen in systems such as a Scott retractor (Lone Star, Houston, TX). This retractor system also has the unique ability to substantially shrink the wound depth due to the stiff nature of the 2 rings, which, when rolled will minimize the effect of operating in a deep and narrow surgical field.

The self-retaining ring wound retractor has an inherent ability to shield and prevent contact of the prosthesis with the skin due to its design. In general terms, infection associated with any urologic prosthetic devices are considered catastrophic events necessitating removal of the device. The usual source of contamination is the operative wound although there are reports of hematogenous spread of infections and subsequent seeding of the prosthesis [2]. The skin harbors numerous organisms and care in cleaning of the skin prior to surgery is paramount as well as decreasing the amount of skin to prosthesis contact. Multiple prospective trials have been performed from other surgical specialties which highlight the use of a self-retaining ring wound retractor and its associated reduction in the incidence of surgical wound infections [3, 5]. In a 12-month randomized controlled trial consisting of 221 patients, the use of the wound retractor showed a statistically significant decrease in the superficial incisional surgical site infections by over 50% (7.2 vs. 14.5%), and concluded that the use of a self-retaining ring wound retractor protected surgical wounds from contamination by bacteria and thus prevent infection [3]. In another trial, over 100 patients undergoing open appendectomy were randomly assigned to conventional wound retraction or retraction with a self-retaining ring wound retractor system. The demographics, including age, sex, BMI, history of diabetes, and tobacco use, were not statistically different between the two groups and the severity of the appendicitis between them was matched. Of the 48 patients enrolled in the traditional retraction arm, there were 7 (14.6%) documented wound infections. Of the 61 patients enrolled in the wound-protection device arm, there was 1 (1.6%) wound infection with the difference being statistically significant [5].

The potential risk of sharp stick injury as well as inadvertent piercing of fluid filled prosthetics is completely removed with the use of this wound retractor system due to its hook-less, ring design. Furthermore, quicker operative times have been documented by a mean of approximately 10 minutes in 29 operative cases secondary to the efficient setup and takedown of this system (table 1). Another compelling advantage of the self-retaining ring retractor system is its lower cost as compared to the

Fig. 1. The self-retaining ring wound retractor.

Fig. 2. Demonstration of the outer ring being folded inward to isolate the skin edges and bring the surgical field into view.

Fig. 3. Demonstration of the novel wound retractor during perineal placement of an AUS.

traditional use of the Scott retractor with variable numbers of hooks which add to cost. The cost savings of this wound retractor is substantial when compared to the current standard of using the Scott retractor with adjustable hooks. The cost of the self-retaining ring wound retractor

is approximately \$60. A Scott retractor costs \$250 and each hook costs \$8 a piece. Thus the cost differential of the traditional Scott retraction system is 4–5 times more expensive than the self-retaining ring wound retractor. Although we have not yet proven the use of this wound retractor could decrease the rates of infection, other studies have proven its efficacy in various open surgical procedures [3, 5]. Its ability to protect the wound edge and minimize the skin-to-prosthesis contact will only prove to be beneficial in future prosthetic urologic procedures. According to a study published in 1988 of the surgical complications related to insertion of penile prostheses with emphasis on infection and cost, the estimated total cost of all infections and complications was calculated to be \$58,500 [6].

Conclusion

Advances such as the identification of risk factors and subsequent appropriate pre-operative interventions, the use of hydrophilic and antibiotic-coated prostheses, and new rescue procedures have been described to prevent prosthetic infection. We describe a rather simplistic and intuitive self-retaining ring wound retractor device that may benefit urologic prosthetic surgery in the future in

terms of surgical exposure, lower wound infections risks, enhanced safety profile, quicker operative times, and substantial cost savings. A prospective randomized control trial evaluating the ease of use, surgeon perceptions of wound visualization, as well as its potential decrease in rates of infections will be needed to verify its potential use for future urologic prosthetic procedures.

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