Management of Intraoperative Complications in Open Procedures

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17.1 Introduction

Attention to surgical details and a commitment to surgical excellence are two fundamental principles that will help provide the best clinical and functional results following open surgical procedures. Most postoperative complications can be clinically related or traced back to technical errors made in the operating room. Thus, the importance of avoiding or reducing intraoperative surgical complications cannot be overemphasized.

Effective management of intraoperative complications in open surgical procedures begins with the avoidance and prevention of dreaded surgical misadventures. A surgical plan must be devised even before an incision is made. The urologic surgeon must be prepared for any potential changes in plan or alternatives that he may encounter during the course of operating. This preparation often times is derived from personal as well as collective experiences in previous clinical practice where lessons are sometimes best learned from mistakes. In this day and age, when modern urology is shifting toward minimally invasive techniques, there remains a need and requirement for maximally invasive surgery to address specific urologic diseases, especially in urologic oncology and reconstructive surgery. This chapter will describe a philosophical approach and management of specific intraoperative complications that the authors have encountered during open urologic procedures. It is emphasized that the best surgical offense starts with good defense.

Prior to entering the operating room, the urologic surgeon must prepare by mentally reviewing four general principles. Firstly, all necessary imaging studies should be obtained preoperatively to completely delineate the disease process, its extent, and its relation to adjacent organs and structures. This provides a working knowledge of the lay of the land, so to speak, such that few or no surprises are encountered. Radiographic imaging techniques have clearly improved over the past decades and provide the surgeon a road map from an anatomical perspective. Proper imaging preoperatively will reduce the potential for surgical misadventures, identify the anatomy and anomalous structures, as well as help identify the so-called pathology of interest. Preoperative imaging studies may also direct the need for consultations with other surgical specialties as deemed necessary.

Secondly, based on the region of the body involved, total familiarity with and understanding of the basic anatomy and the relations between organs, vessels, bones, and tissue planes are an absolute requirement. This becomes exceedingly important in reoperative surgery and even more so in the irradiated patient where complication rates escalate due to the disruption of normal anatomy. This includes intraabdominal, retroperitoneal, and pelvic anatomy (Touma et al. 2005; Crawford and Skinner 1980).

Thirdly, the most appropriate surgical approach and incisions must be determined in order to provide the necessary operative exposure. In cases of large retroperitoneal masses arising from renal, adrenal, or germ cell tumors, the great vessels and their many branches as well as intestinal segments such as the duodenum may be intimately apposed or involved. Proper exposure is mandatory as normal anatomical relationships may become unrecognizably distorted. Surgeons should utilize a proper incision from a repertoire that is familiar and comfortable. An incision may be extended in situations where poor exposure may limit an appropriate dissection or inhibit the surgeon’s ability to operate. Thus, the patient should be properly positioned,
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17.1.2 Vascular Complications

17.1.2.1 General Principles

No other operative mishap is more stressful or feared than a major vascular injury. The surgical management of a number of urologic diseases requires close dissection along major arterial and venous vessels, branches, and networks. In the event of a vascular injury, it is essential that the surgeon remain calm and direct the surgical staff in preparation for control of the injury. Constant communication with the anesthesiology staff should be maintained. A momentary pause may be required of the surgeon as the anesthesiologist prepares for possible rapid and large-volume blood loss. In anticipation of possible rapid volume resuscitation, adequate venous access, with large-bore peripheral venous catheters or central venous catheters, should be obtained by the anesthesiologist prior to surgery. Additional suction tubing and surgical assistants may be necessary to provide a clean working field and additional hands for retraction. Large masses may obstruct vision within the operative field and/or may have large parasitizing vessels themselves that are susceptible to injury. It is prudent and maybe necessary to proceed with first extirpating large tumors while temporarily controlling hemorrhage with manual pressure. After removing the mass and surgical vision is improved, the vascular injury may be more safely and efficiently repaired.

Lymphadenectomy in the treatment of testicular, renal, bladder, and prostatic cancers often requires close dissection along major vessels. It is imperative that subadventitial dissecting planes be avoided, as this weakens the integrity of vessel walls and may lead to rupture. This is especially the case when performing a postchemotherapy retroperitoneal lymph node dissection. A thick and adherent layer of tissue encases the great vessels. In the case of the aorta, the surgeon may inadvertently enter a subadventitial plane and continue dissection before realizing the mistake. This will result in a large surface area of the aortic wall becoming significantly compromised and eventually rupturing. These consequences underscore the important principle of proximal and distal vascular control.

As may be the case in elderly patients with bladder or renal tumors, associated co-morbidities such as peripheral vascular disease and atherosclerosis may result in arteries that are calcified and brittle with intimal plaques. Overhandling these vessels both manually and with instruments may result in plaque embolization or even rupture. Vessels should be palpated for firmness or brittleness prior to placement of vascular clamps. Severe tortuosity of vessels often indicates significant vascular disease.

In anticipation of extensive vascular dissection, the proper instruments, including sutures, forceps, needle holders, and vascular clamps, should be readily available on the sterile field. Nonabsorbable suture such as cardiovascular silk or monofilament polypropylene (Prolene) on a fine vascular needle should be utilized on vessel walls. The choice in suture material is mostly determined by surgeon preference; however, distinct advantages between silk and Prolene exist. Silk is generally easier to handle and tie. Prolene is thought to induce less of an inflammatory response and be less likely to harbor infection. Vascular forceps with fine serrations or interdigitating teeth allow delicate handling of vessel walls. Fine vascular needle holders with diamond jaws allow for precise handling of suture without damaging or distorting the needle.

A variety of different vascular clamps are a vital set of instruments that the urologist must be familiar with. Application of these clamps is best performed in a controlled setting with proximal and distal control of the vessels, a fundamental principle of vascular surgery. Often times dissection of difficult tissue planes or adherent tumors may involve major vessels. Obtaining proximal and distal control of vessels prior to inadvertent injury allows for rapid control of hemorrhage as the operative field is cleared and the injury is addressed. Vascular control may also be obtained using Rummel tourniquets fashioned from red Robinson catheters and moist umbilical tape (Fig. 17.1.1).

Topical hemostatic agents such as oxidized regenerated cellulose (Surgicel), absorbable gelatin sponge (Gelfoam), and microfibrillar collagen (Avitene) are adjunctive agents of hemostasis used in all specialties of surgery, including urology. Newer agents such as Nu-Knit (Ethicon, Johnson & Johnson, Cincinnati, OH, USA), FloSeal (Baxter, Deerfield, IL, USA), and Tisseel (Baxter) are variations of the original theme with different delivery mechanisms. It should be noted that these agents are supplemental tools of hemostasis and do not substitute for traditional surgical techniques of vessel ligation or suturing to control bleeding. Brisk arterial bleeding must be dealt with in a surgical manner.