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REVIEW ARTICLE

Problems in pelvic cytoreduction - Hostile pelvis

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Summary

Surgeons learn over time when it is appropriate to recommend an operation. This is particularly true in the management of pelvic carcinomatous disease, which often gives rise to symptoms that are debilitating and difficult to manage by non-surgical means. Radical pelvic cytoreduction, complete resection of all visible tumor, remains the established operation for the treatment of carefully selected patients with biologically favorable tumors. Complexities in pelvic surgery and pelvic cytoreduction cover the strategic evaluation, specific approaches, and management techniques. The essential principle to removal of a very advanced pelvic disease lies in the retroperitoneal surgery. The retroperitoneal approach allows for dissection of the pan-pelvic tumoral mass and deposits using the peritoneum as a pseudo-capsule while identifying vital retroperitoneal structures such as the iliac vessels and ureter. Despite the fact that there are several considerations in favor of cytoreductive surgery, overall morbidity due to its application depends not only on the extent of the surgical procedure but also on the patient's medical fitness, the experience and expertise of the operating surgeon, as well as the quality of the supportive care, particularly anesthesia and critical care. The major source of trouble is the hostile pelvis itself. The reasons are fairly clear: most patients have had incomplete 'in-line' resective attempts, irradiation, and inflammation due to prior overhealing. Many of the complications of the procedure can be ameliorated or eliminated by careful attention to patient preparation, intraoperative meticulous technique, and post-cytoreductive intensive care. Achieving success and safety with these cytoreductive techniques requires extensive knowledge of pelvic anatomy, the use of special techniques of exposure and methods of dissection, a clear understanding of the objectives of the operation, and a flexibility of mind.

Key words: *hostile pelvis, pelvic cancer surgery, pelvic carcinomatosis, pelvic cytoreduction, pelvic morbidity, pelvic reconstruction*

Introduction

The pelvis is a three-dimensional compartmental, highly complex anatomical space that has many important gastrointestinal, gynecologic, urologic, vascular, and neurologic organs and structures surrounded by embryologically developed fascial planes. These intrapelvic organs are essentially and functionally supported by ligaments, muscles, and osseous boundaries that are intermingled with dense vascular, lymphatic, and neurologic network in between [1]. For a successful primary operation the pelvic surgeon should know the anatomical relationships between these different systems. However, the traditional surgical education does not include any live demonstrations of pelvic surgical techniques as well as fresh cadaveric courses [2]. Neophyte surgeons can only have the chance to learn the basic tenets and advanced procedures from badly copied and cloned drawings or from the performance of their mentor at the institution, if there is anyone who actually likes to operate on a difficult patient with locally advanced disease in the primary and reoperative setting [3]. Lacking the required anatomical road-mapping and expertise the surgeon inevitably will present complications which are potentially challenging to manage intraoperative-

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ly because of mostly irradiated, traumatized, and inflammated (reoperated) pelvic tissues ("*Hostile Pelvis*") [4] (Figure 1). Backward analysis of imprints of a variety of unwanted complications and locoregional recurrences end up with an address of technically insufficient and improper operation. One aspect of the hostility mainly comes from anatomical (anterior angulation of the pelvis, non-retractable osseous margins, narrow male-android pelvis, complex vascular anatomy, and close proximity of critical vascular, urologic, and neurologic structures) and pathophysiological (tightly adhered or fixated small bowel loops to the pelvic organs and to the denuded surfaces and possibly ectopic position of the ureters in the re-operated cases, plasterized fibrosclerotic tissue planes enveloping in and around the organs) risk factors [5]. The other aspect of hostility raises from the limitness of well-educated and experienced pelvic mentors, distorted anatomical planes secondary to previous incomplete trial dissections, irradiation, infective complications in the first surgery, the technical difficulty in performing *en block* 'out-line' radical pelvic resection, the lack of local fresh tissue and/or artificial organ to use in the repair and reconstruction phase which is a very crucial part of the extensive pelvic cytoreduction [6]. Large advanced tumors, severe radioenteritis, tumoral compartmental transgression, low rectal stump, medically unstable patient, and inexperienced surgeon are the other well-described risk factors, particularly in the re-operative pelvic surgery [7,8]. Many studies reported controversial data for pelvic cancer salvage due to differences in mixed patients, recurrence patterns, treatment modalities, and overall survival. The tendency of advanced primary or recurrent high-volume disease to obliterate the normal anatomy of the pelvis may lead to an abbreviated suboptimal debulking procedure or abandonment of primary surgery altogether. Not surprisingly, radical complete resection (negative margin(s)) is mandatory for cure. The major problems to counteract this curative intent are multi-organ involvement, challenging pelvic anatomy, decreased sojourn time of tumor cells, no enveloping tissue compartments ('anatomic boundaries violated') (Figure 2), and adverse effects of irradiation [9,10]. However, the presence of peritoneal barrier, a variant of tumors that remain persistently localized to the pelvic region ('non-avid to early metastases'), the reality that the recurrence of disease does not mean a systemic disease every time, and the benefits of chemoradiotherapy in responders are the positive factors to decide to perform such extensive operations that can be potentially morbid and mortal but also curative [6,8,10,11]. Thus, something more than a blind tradition is required; the patient should no longer be subjected to standard operations but the operation should be fitted to their unusual needs. Central challenges over the past 60 years were to define which group of patients would benefit most from this aggressive surgery (Table 1), to refine surgical techniques and thereby improve perioperative morbidity and mortality, and to determine the feasibility of complete resection (clinical, imaging: Spiral CT, MRI, and PET/CT) to carefully select the patients with a real chance of cure [7,8,11,12]. Widely accepted contraindications to resection of pelvic disease are listed in Table 2 [13-15]. The main problem is the unsolved critical issue of oncologic surgery: 'detecting microscopic invasion' and 'determining metastatic foci within normal-sized lymph nodes', because the most robust prognostic factor after the so-called curative resection is the occurrence of lymph node metastasis. But, these exercises in themselves can be depressing: assessment can be difficult when there is dense fibrosis and fixation as a result of previous surgery, inflammation, and/or radiotherapy. One must not totally rely on these studies. In many cases the final decision still has to be taken at the time of exploratory laparotomy. Thus, liberal use of preoperative biopsy attempts and frozen section is invaluable to confirm loco-regional disease.

Surgical philosophy of radical pelvic cytoreduction [16-18]

1. It is really the most radical attack to cancer.
2. It removes basically all threatened or involved pelvic organs/tissues.
3. The ultimate goal of extended/cytoreductive surgery should always be resection of the tumor with clear (negative) margins.
4. Limited forms of extensive surgery have the benefit of sparing possibly uninvolved organs, the trade-off will be the increased risk of recurrence.
5. The more advanced the primary disease, the more likely is central treatment failure.
6. The patient must be fully informed about the benefits and risks of this procedure.
7. He (or she) must demonstrate understanding and acceptance of all possible consequences.
8. It can provide a significant salvage rate in patients with advanced or recurrent pelvic carcinomas.

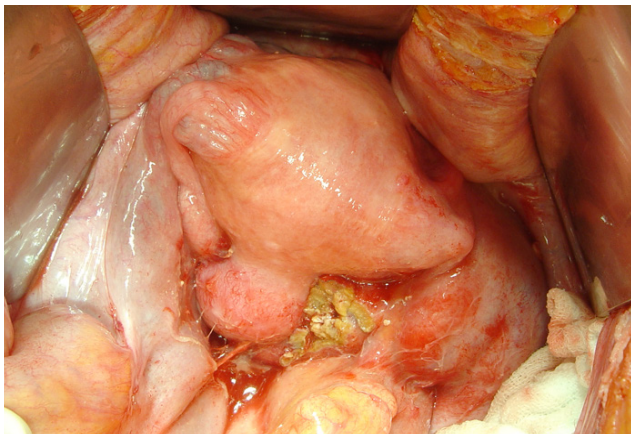


Figure 1. Pelvic carcinomatosis in previously operated, irradiated, anatomically distorted, and traumatized pelvic tissues ("Hostile Pelvis").

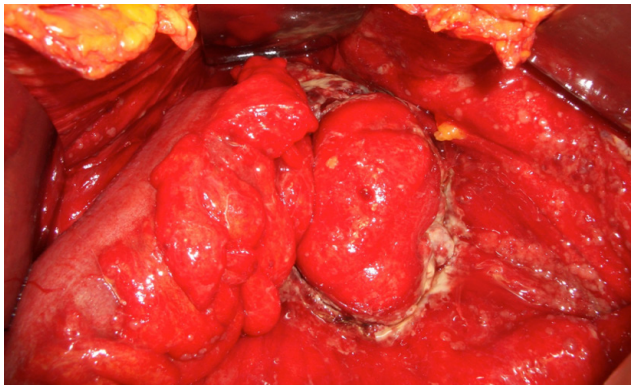


Figure 2. So-called seemingly "frozen pelvis" in peritoneal carcinomatosis due to primary advanced ovarian cancer. Fixated tumor mass and secondary deposits glued and matted together the adjacent organs/structures violating the enveloping anatomic boundaries.

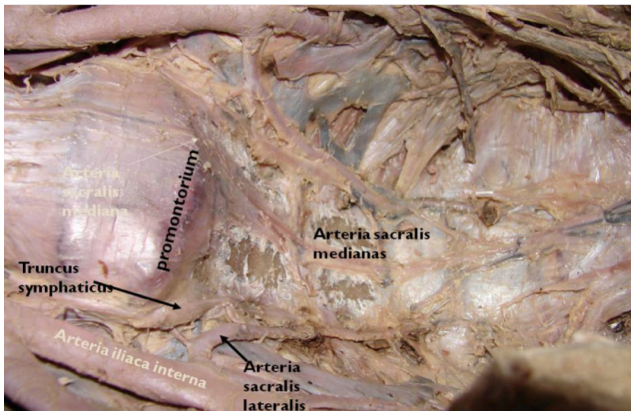


Figure 3. Provisional dissection should begin to identify and expose the well-known anatomical landmarks ("friends of the surgeon"), particularly in reoperated patients.

9. There is no other equally curative form of therapy for this distressing and unfortunate condition.
10. Rather than relegating patients with particularly recurrent malignancy to the scrap heap of repeated chemotherapy and irradiation which are rarely curative, one should consider complete cytoreduction whenever possible.
11. The operation can be taxing and stressful, for even the experienced surgical team – the center and the patient.
12. A stereotyped, systematic-standard pelvic cytoreductive operative technique is impossible to describe (a complex group of surgical procedures).

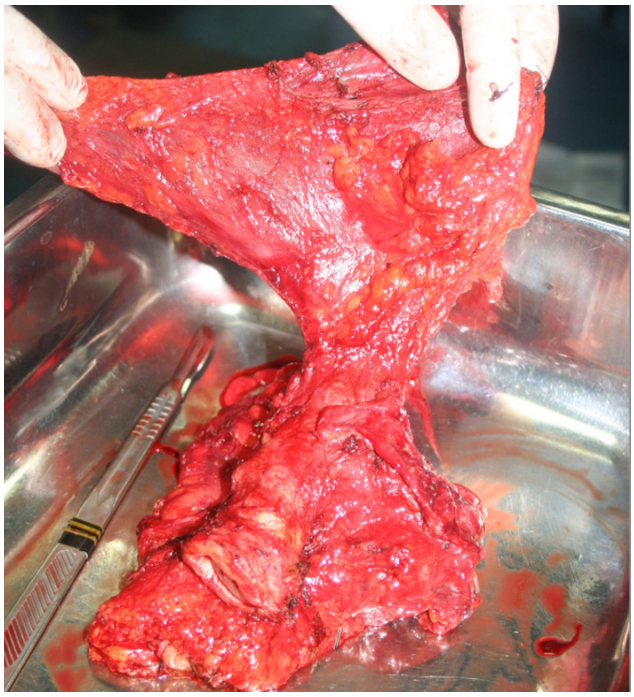


Figure 4. Intrapelvic *en block* multivisceral compartmental resection and pelvic peritonectomy.

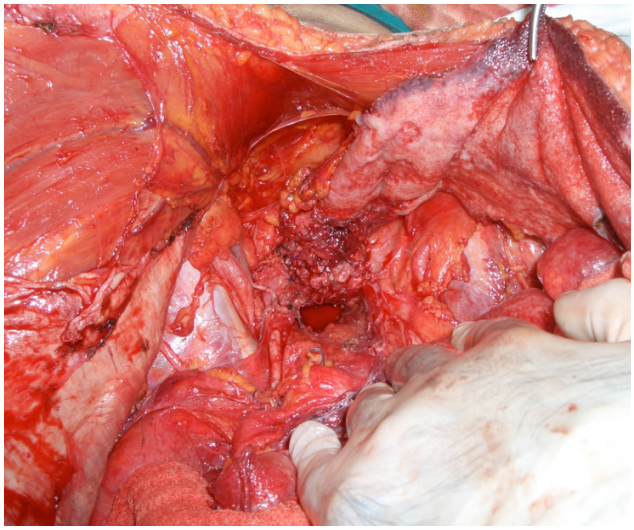


Figure 5. Cytoreduced pelvis with left-sided pelvic peritonectomy proceeding to the "uncompleted" right side.

Table 1. Decision-making for the resectability

1.	The location and the extent of the tumoral mass: its relationship with the anatomical fixed landmarks ('friends of the surgeon') (Promontorium/sacrum, iliac vascular compartment, pubis, urinary bladder) (Figure 3).
2.	Surgical margins: multiple?, the closest one? Need for extra-radial margin for pelvic sidewall involvement?
3.	Adjacent organs/tissues: aorto/vena cava, iliac vessels, ureter, urinary bladder, sacrum, pelvic sidewall, sciatic notch.
4.	Patient's general condition and attitude.
5.	Experience and oncological culture of the surgical team

Table 2. Contraindications for surgical resection

1.	Extrapelvic unresectable metastatic disease.
2.	Encasement by tumor of the external or common iliac vessels.
3.	Circumferential pelvic sidewall involvement.
4.	S1 or S2 bony or neural involvement.
5.	Sacral root nerve involvement.
6.	Poor surgical risk (ASA IV-V).

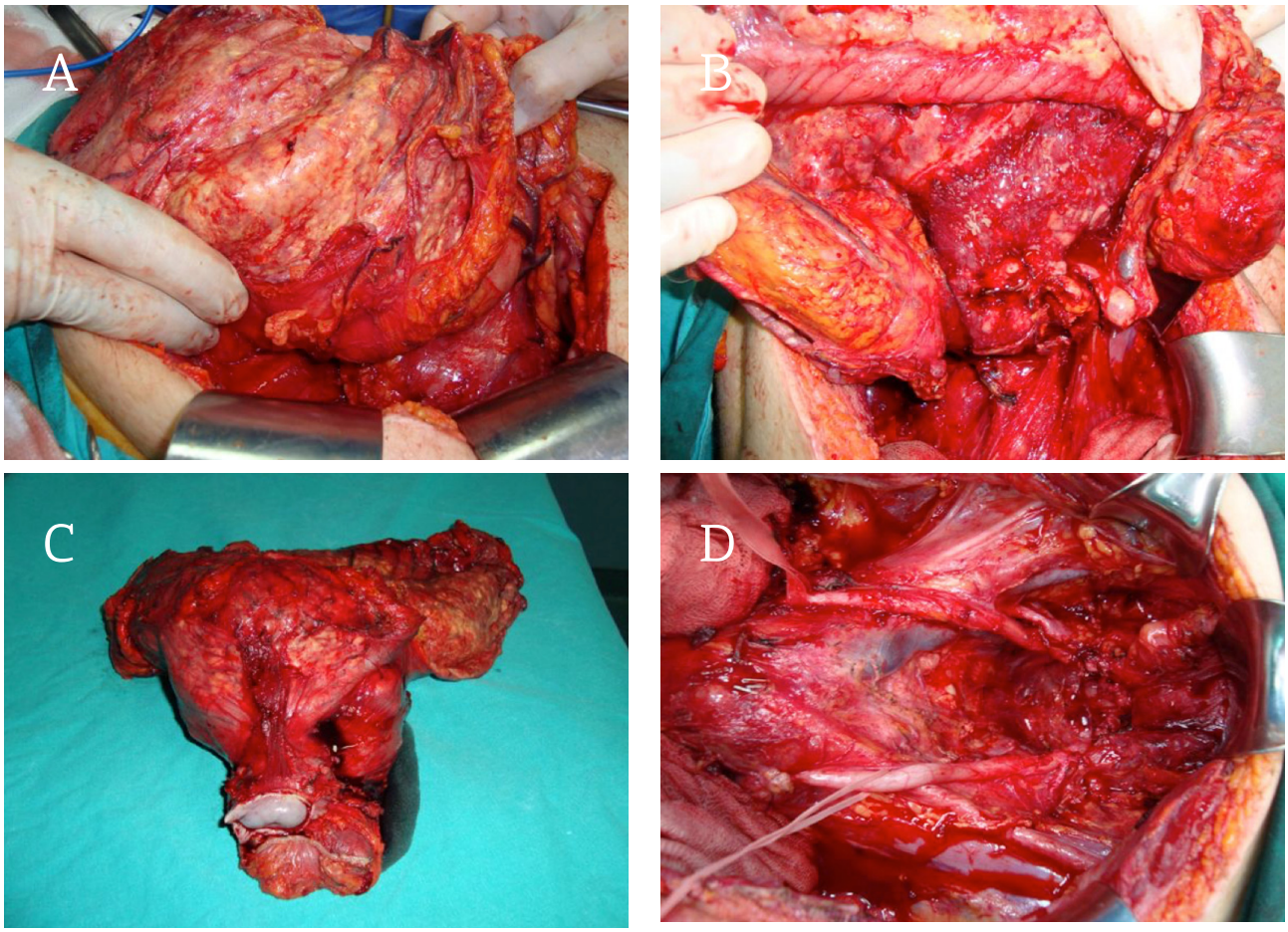


Figure 6a-d. Cytoreduction of extensive pan-pelvic disease with therapeutic lymphadenectomy and one-sided pelvic lateral wall resection. **a:** Dissection and mobilization of centrally-placed advanced ovarian cancer wrapped to the sigmoid colon, upper and mid-rectum, and omentum seemingly as one bulky tumoral mass. **b:** Many tumoral deposits can be seen on the pelvic peritoneal surfaces and over the rectosigmoid mesentery. Trivial dissection proceeds through the presacral retroperitoneal hollow and the pararectal webs. **c**: *En block* resection of multi-organ involved central extensive disease with complete peritonectomy. **d:** View of the cytoreduced primary pan-pelvic disease with peritonectomy and lymphadenectomy.

Critical oncologic principles to avoid the "unwanted" [19-21]

1. Timing of the operation and positioning of the patient is important.
2. Capacity and expertise of the operative team to take right decisions under pressure.
3. Re-evaluate the abdomino-pelvic regions for real chance of resectability: never insist on one-plane of dissection!
4. Trial dissections to identify the anatomical landmark elements and to expose surgical field/embryologic visceroparietal compartments not to pass the 'point of no return' (with respect to resection of vital structures) (Figure 3) [11, 22, 23].
5. Presacral posterior and posterolateral and then anterior retroperitoneal dissection is the safest and proper initial way of beginning and proceeding the dissection.
6. Ureters and urinary bladder have to be identified and protected at the very initial phase of the operation for they are the number one reason of morbidity.
7. The surgeon must have the skill and expertise to perform intrapelvic multivisceral combined compartmental resection(s), pelvic peritonectomy (Figure 4), aortacaval-iliac lymphadenectomy; he or she should know that the tumors advanced in malignant progression increase their permissive territory with respect to embryologic kinship. For a safe and appropriate dissection and assessment, there is utmost need to understand the concept of embryologic, anatomically-based progressive tumoral permeation and transgression to foresee the risk of tumoral fragmentation and contamination of the field, and eventually decreased radicality and survival [11,19,21,23].
8. Pelvic reconstructive phase, including procedures particularly focused on the repair of urinary continuity or construction of a urinary diversion; colorectal(-anal) anastomosis and proximal diverting stoma or extended Hartmann or APER; reconstruction of the pelvic floor and the vagina (usually are required for infralevatoric exeresis) to prevent major complications such as pelvic sepsis, bowel obstruction, and intractable fistula formation which are the frequent reasons of high morbidity and mortality [22].
9. Tandem repair of oncologically created or multi-recurrent incisional abdominal wall defect due to previous operations resulted in severe wound infection and large tissue loss [24].

Pelvic cytoreductive surgery techniques [17,18,21]

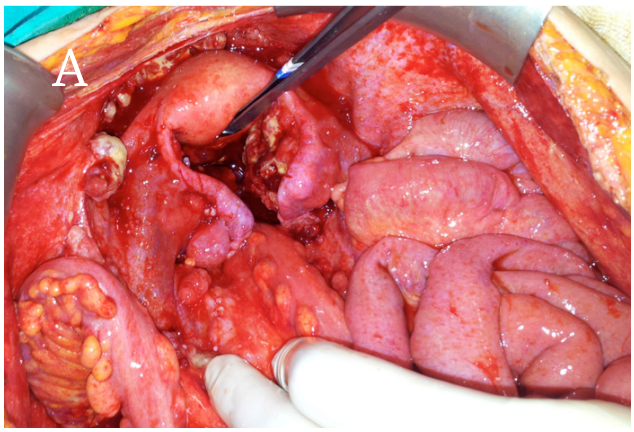
Cytoreductive pelvic surgery, specifically designed for the intact complete removal of a fixed tumor and infiltrating tumor deposits *en bloc* with attached peritoneum (Figure 5) and surrounding organs/structures with/without bitemplate aorta-caval/pelvic lymphadenectomy, places great demands on the patient's physiologic reserves and the surgeon's stamina. In multi-compartmental and multi-organ *en block* pelvic resections, blood loss can be prodigious and operative time protracted [25,26]. The patient is likely to benefit from the involvement of two fresh surgical teams in these lengthy, problem-prone operations. The cost-benefit analysis of the performance of this procedure should carefully state the intent of the operation, the overall status of the patient, and the aggressiveness of the disease. There is no standard, single-type fashion, descriptional radical extirpative procedure; instead, the surgeon must be ready to use the several techniques of retroperitoneal surgery in his (her) own armamentarium with ante- and retrograde approach, in order to encompass and evacuate the visible tumor garbage with many satellite implants in different sizes all over the peritoneum and the adjacent organs [27-29]. To define the scope and magnitude of surgical resection, the author briefly described and classified the potential pelvic cytoreduction techniques to deal with the primary advanced or recurrent pelvic cancer:

Type I cytoreductive surgery ("CRS type I"): *en block* resection of multi-organ involved lateral extensive disease with peritonectomy, +/- ipsilateral pelvic LNx (as indicated)

Type II cytoreductive surgery("CRS type II"): *en block* resection of multi-organ involved central extensive disease with peritonectomy, +/- bitemplate aorta/caval-iliac 6 echelons LNx (as indicated)

Type III cytoreductive surgery("CRS type III"): *en block* resection of multi-organ involved extensive pan-pelvic disease with peritonectomy, +/- bitemplate aorta/caval-iliac 6 echelons LNx (as indicated)

Type IV cytoreductive surgery("CRS type IV"): *en block* resection of extensive pan-pelvic disease with peritonectomy, +/- bitemplate aorta/caval-iliac 6 echelons LNx (as indicated), and one-sided pelvic lateral wall excision (rare) (Figure 6a-d)[30]



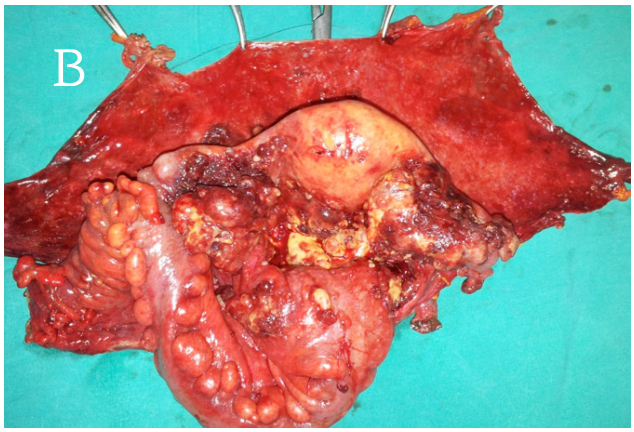


Figure 7a,b. Exenterative cytoreductive surgery of extensive pan-pelvic disease with pelvic peritonectomy and lymphadenectomy. **a:** Locally very advanced ovarian cancer with extensive pan-pelvic disease conglomerated as a chaotic tumoral mass with lots of satellite tumoral studdings in and around the pelvic organs and the pelvic peritoneum. **b:** Exenterative cytoreduction of extensive pan-pelvic disease with peritonectomy and lymphadenectomy.

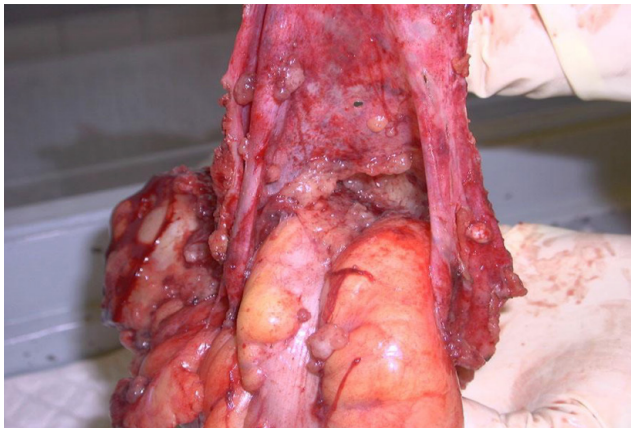


Figure 8. Typical hostile pelvis: densely adhered and conglomerated small bowel loops glued to iliac vascular structures, urinary bladder, and/or rectosigmoid colon blocking the dissection of pelvic anatomical planes.

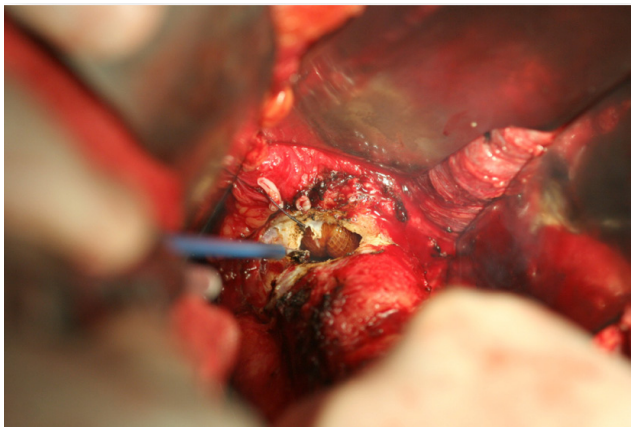


Figure 9. Placing a povidon-iodine embedded sponge to posterior vagina will be helpful to orientate in deep "chaotic" pelvis.

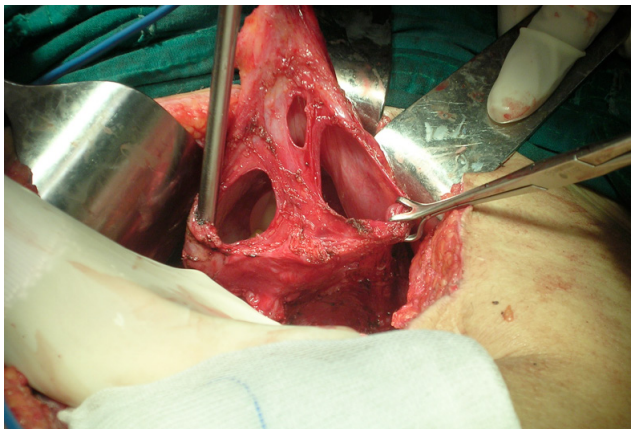


Figure 10. Intrapelvic scattered tumor nodules can infiltrate the pelvic peritoneum over the urinary bladder so deeply that dissection efforts can result with many large tears ("*Scream mask*").

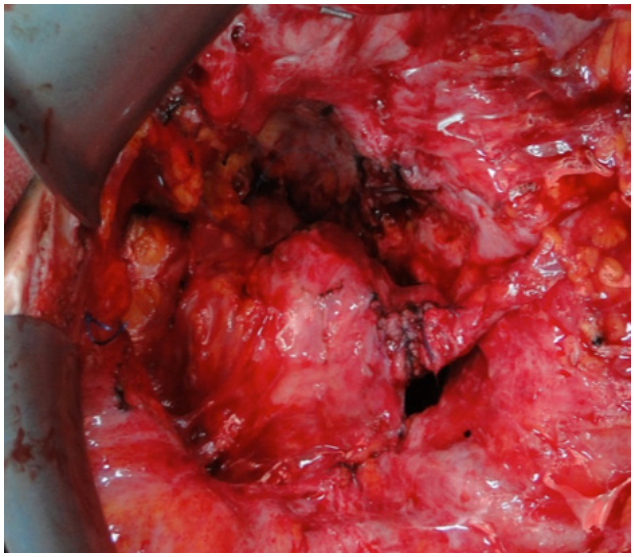


Figure 11. Reconstruction of urinary continuity with uretero-neocystostomy.

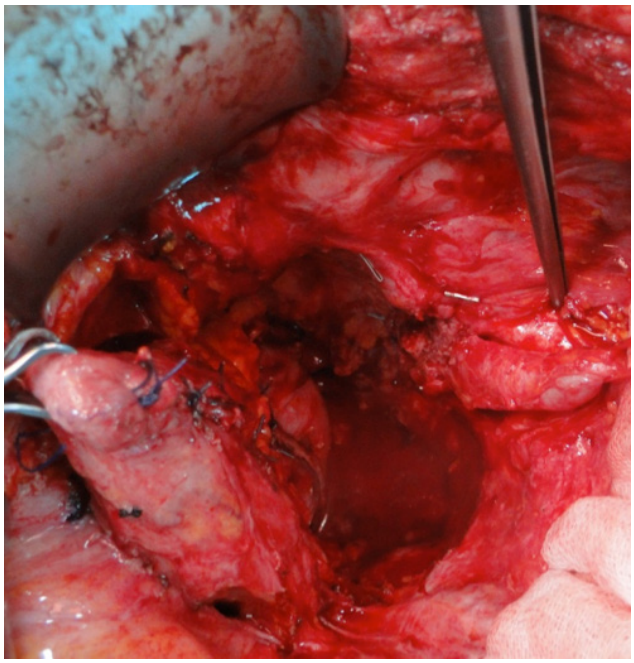


Figure 12. Ureteroneocystostomy reconstruction with Boari flap.

Type V exenterative cytoreductive surgery("CRS type V"): total pelvic exenteration of extensive pan-pelvic disease with peritonectomy, +/- bitemplate aorta/caval-iliac 6 echelons LNx (as indicated) (Figure 7a,b).

Terminology aside, the cardinal feature of the cytoreductive pelvic surgery is the retroperitoneal approach to pelvic carcinomatosis encasing the pelvic viscera, utilizing the tendency of containment of the tumoral bulk and/or lots of tumor studdings by the pelvic peritoneal planes and the *cul-de-sac*, particularly if the pelvic organs can no longer be clearly identified.

Frequent problems

Severe multiple battlefield-type adhesions

The degree and type of multiple adhesions can be so severe and extensive that the surgeon may leave some part of his energy and motivation at this step (Figure 8). First, the surgeon must be calm and endurant to protect the ureters and the iliac vascular compartment and begin the meticulous sharp dissection from the non-operated easiest side, if it is possible to do so, and prefer to proceed under the mesentery from right to left. For the sake of *en block* oncologic resection conglomerated bowel segments glued to the tumoral mass should be left over it with GIA stapler resection (round-and-round intrapelvic prevascular dissection). Following the fibrosclerotic mesenteric attachments, kinks and twists with sharp extra-fascial dissection and/or hydrodissection can lower the rate of enteric contamination. Sometimes transillumination of the battlefield with rectoscope can help to identify what's what. It is interesting to note that both sides of the urinary bladder are less affected from the irradiation. If there are sub-obstructed bowel loops, place them under wet lap pads at the upper abdomen with 'Freddy hand-typed' Thompson retractors to protect the wide exposure and not to compromise frequently the bothersome adhesiolysis part of the pelvic surgery. Serosal tears should be sutured and inadvertant injuries should be repaired with absorbable sutures immediately by conquering the afferent and efferent bowel segments in the surgical field. It must be remembered that the usage of the GIA staplers must be avoided in the bowel segments having anatomically narrow, fixed, and less well-vascularized mesentery which are relatively highly exposed to the pelvic irradiation dose and are possibly going to be used in the reconstruction phase, as the consequence will be the significantly increased leak rate.

Synechia between urinary bladder and vagina

These two maneuvers can be so helpful: (a) putting a povidon-iodine embedded sponge to posterior vagina before the operation and (b) inflation of the urinary bladder with serum saline to ease the dissection. From the very initial phase ureters should be identified, slinged, paced to the urinary bladder, and kept an eye on it (also remember the '*water under bridge*' analogy to determine the uterine artery-ureter proximity in the woman) [31]. Deep pelvic retractors should be always in use to expose the uretero-vesical junction. Bulky tumoral mass, matted bowel loops, distorted anatomical planes and scarred tissues especially in irradiated hostile pelvic environment do not permit to make a dissection properly and safely ('*Scream mask*') (Figure 9). Thus, in this situation prefer to do cystostomy-aided or partial bladder resection (mostly mandatory)-aided retrograde identification and dissection.

Ureter and urinary bladder injuries and repair techniques [31-34]

In traditional approach, it is common to place bilateral ureteric stent preoperatively, however, it is usually realized that it is technically impossible to put at least one of them due to the tumoral deposits situated at the pelvic sidewall and/or nodal infiltration around the iliac bifurcation and/or

plaque-type retroperitoneal tumoral infiltration through the iliopsoas muscle and combination of compression effect of recurrent/residual tumor garbage in the trigonal region, particularly in the occurrence of heavily-infiltrated, disseminated, and complicated intrapelvic recurrent disease. Thus, there is no need to state the importance of identifying the proximal ureters and controlling them at the pelvic brim to recognize their possibly attacked and/or aberrant position in the reoperated hostile pelvis. The surgeon must be aware of using sharp dissection around the ureters so as not to injure their vascularization and to get them out off the surgeon's harm way. Through the whole stages of radical pelvic cytoreduction there can be necessity to resect the ureter(s) and/or urinary bladder (partially or totally) to achieve complete resection, that is macroscopically eradication of all visible pelvic disease. A variety of surgical repairs can be used to reconstruct urinary continuity such as primary repair over double-J stent or uretero-neocystostomy (UNS) (Figure 10); partial bladder resection and UNS; UNS with the usage of 'Boari flap' and/or 'Psoas hitch', or total bladder resection as in total pelvic exenteration and ileal or transverse colon conduit. It is therefore incumbent upon the surgeon operating on patients with locally extensive advanced primary or recurrent intrapelvic carcinomas to be intimately familiar with the relevant pelvic anatomy and skilled in the techniques of radical pelvic surgery that are addressed in these pages.

Pelvic and presacral hemorrhage [13-15, 21]

The narrow constraints and complex three-dimensional anatomy make pelvic surgery difficult and prone to potentially catastrophic bleeding complications from injuries to vessels on the pelvic sidewalls, sacrum, or genitourinary structures. Should dissection proceed outside the endopelvic fascia on the pelvic sidewalls, the internal iliac vessels may be injured. Fibrosis, radiation, and inflammation are essentially damaging in this area. Hemorrhage from the iliac veins is frank and difficult to control, as these vessels are large and thin-walled. Careful suture ligation should be attempted at the risk of causing further tears. Temporary inflow occlusion of the iliac arteries may aid in direct control. For both sidewall and sacral bleeding, rapid completion of the planned resection will aid exposure. The anesthesiologist should be made aware that active and rapid hemorrhage is possible. During dissection in the presacral space tears can occur in the branches of the presacral plexus or the sacral basivertebral veins emanating from the sacral bone itself. Pressure in these veins is two to three times that of the inferior vena cava. This can result in life-threatening intraoperative hemorrhage. Prevention of this potentially devastating problem is paramount. Should presacral bleeding occur, initial firm tamponade and placing the patient to deep Trendelenburg position allow the operative team to prepare. First attempt to control the bleeding is to suture with pledgets or pieces of vascular graft or clip application, particularly for smaller surface vessels. These efforts may prove futile as the vessels that are lacerated flush with the anterior bony table of the sacrum. In this instance, hemostasis can be obtained by treatment modalities such as argon beam coagulation, inflatable devices, rectus muscle fragment welding (Figure 11), titanium thumbtacks, and application of endoscopic staplers. Local hemostatic agents in conjunction with diathermy, cyanoacrylate tissue adhesives, fibrin glue, topical procoagulants, and application of bone wax are among other choices, which may help to treat this serious problem. If all these measures fail, tight packing of the presacral space always controls but often requires a return to the operating theater to remove the packing (Figure 12). Angiographic embolization is occasionally useful for the rare case of arterial hemorrhage.

Pelvic partition and reconstruction of the pelvic floor

Although general complications, wound problems, and urinary leaks of urinary repair or diversion explain many of the difficulties arising after cytoreduction, *the major source of trouble is the pelvis itself*.

The reasons are fairly clear. Many patients who undergo pelvic cytoreduction have had other surgery and irradiation. Once the pelvic viscera are removed partially, near-totally, or totally, they are left with a raw, poorly healing, empty cavity bounded by dense scar tissue, major blood vessels, and bone with occasionally created large pelvic floor defect. Unless deterred, small bowel rapidly drops into this space and adheres sticky to one or more of the structures in it. The extent of pelvic dead space often predisposes patients to fistula formation, bowel and urinary obstruction, and pelvic abscess – all of which may lead to pelvic sepsis and death. The reoperation rate is quite high for complications and more morbidity frequently results from the additional surgery. Thus, another important technical consideration is the method of pelvic partition and pelvic floor recon-

struction, which should have as its goals obliteration of pelvic dead space to avoid subsequent complications and keep the intestine out of the pelvis. Advocates of different procedures have all reported decreased complications, but a systematic comparison of these techniques (reperitonealization methods using an omental sling, colonic mesentery, absorbable synthetic mesh, biologic biomaterial, prosthetic devices, tissue expanders, and myocutaneous flaps) has not been done. The choice therefore depends on the surgeon's discretion, institutional differences, tissue availability, and expected oncological outcomes. Complex reconstruction that may prolong recovery and compromise the duration of quality time left for the patient should be prevented. Although many gynecologic oncologists addressed the use of peritoneal flaps, omentum, synthetic/biologic mesh to create a pelvic lid for pelvic reconstitution to exclude the small bowel from the cytoreduced pelvis, other oncologic surgeons are less convinced of the necessity for closure of the pelvic inlet. Many observations showed that obliteration of the pelvic dead space to avoid postoperative pelvic sepsis is more important than creation of a pelvic lid. In addition, closure of the pelvic inlet with a variety of surgical approaches entails a risk of bowel incarceration or entrapment with obstruction if defects develop postoperatively. Experiences indicated that it was not enough only to keep the bowel out of the pelvis while it healed. What was needed was a method to line raw pelvic surfaces, protect exposed bone and hypogastric vessels, obliterate dead space, and recreate a pelvic floor. In the pelvic exenterative-type surgery, reconstruction can be performed with either the use of gracilis or a vertical (VRAM), transverse (TRAM), or oblique (ORAM) unilateral rectus abdominis myocutaneous flap and the pelvic urinary enteric conduit to refill the pelvic cavity. The decision is based primarily on the surgeon's preference and the patient's anatomy.

Reconstruction of the abdominal wall defect [24]

Not infrequently, particularly in radical (re-) cytoreductive efforts, there will be a need to synchronously reconstruct the oncoplastically-created or re-herniated large musculo-fascial defect with a type of dual-surfaced synthetic prosthesis or with a biologic graft in highly-contaminated/infected patients as a bridging fascial substitute. However, it can be a daunting task to perform a sound immediate repair in the exhausted abdominal wall because of previous repair(s), stoma placement, infected, protruded or fistulated mesh, radiation therapy, or the usage of rectus abdominis muscle-skin flap. The reconstructive goals are to protect abdominal contents and to provide functional support. Prosthetic meshed biomaterials are ideal for use in midline repair of moderate myofascial defects because of technical accessibility. Several different techniques and various options have been used to place mesh material that is beyond the scope of this overview. Severe myofascial defects not amenable to components separation and prosthetic mesh repair may also be reconstructed by using autologous tissue (flap) from a local or distance source. In the heavily contaminated or possibly infected wound, most authors recommend temporary repair using absorbable mesh or biologic graft. A procedure is delayed if the patient is unstable, reconstructive options are limited or too risky, the wound is significantly infected, or further surgical procedures are planned.

Conclusion

The complete cytoreduction of pelvic carcinomatosis represents a formidable challenge to surgeons because of technical difficulties resulting from the anatomic confines of the pelvis, complex biologic considerations, and the considerable risk of major complications. Resection of the primary or recurrent tumor mass, pelvic peritoneal implants and lymphadenopathy are integral components of the cytoreductive surgical procedure for the treatment of carefully selected patients with biologically favorable tumors. Radiation and medical oncologists, who are instrumental in bringing about the essential down staging effect, provide pivotal assistance to the oncologic surgeon in achieving tumor-free resection margins and preserving the function of some of the pelvic organs. Unfortunately, the surgeon sometimes discovers only after the 'point of no return' or '*no-go areas*' has been passed in a cytoreductive operation that a pelvic carcinomatosis cannot be resected for cure. Unintentional palliative (debulking) cytoreductions of this nature are occasionally unavoidable. Cytoreductive pelvic surgery also creates exceptional reconstructive challenges that must be addressed adequately in order to minimize problems and maximize the patient's subsequent quality of life. Ultimately, sound surgical judgement, technical skill and meticulous attention to important details are the basic principles to the successful completion of radical pelvic cytoreduction, particularly in hostile pelvic environment.

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