Anterior half of the perineal dissection can be carried out to communicate with the transabdominally developed anterior pelvic dissection, in order to facilitate the posterior dissection once the patient is re-positioned.

If a very large posterior defect is anticipated, a rectus abdominis myocutaneous flap can be harvested and rotated into the pelvis at this juncture, so that it can be accessed for perineal closure after completion of the posterior resection. Alternatively, for lesser-sized defects, an omental pedicle flap can be created and placed in the pelvis prior to abdominal closure, so that it can be retrieved and used to facilitate closure at the termination of the procedure.

After abdominal closure +/- a stoma creation, the patient is then placed in the prone position. In the case of anorectal preservation, a midline incision is made from the posterior anal sphincters to the sacrum. The anococcygeal ligament, a midline incision is made from the posterior anal sphincters to the sacrum. The anococcygeal ligament

**REFERENCE**


RESULTS

Results of treatment are dependent on the nature of the various retrotumors and adequate resection. Chordomas have about a 10% metastatic rate, with a recurrence rate of 28% to 64%. Ten-year survival rates range from 20% to 76%. The Memorial Sloan-Kettering Cancer Center experience of malignant retrotumors cite a 5-year survival of 69% and 10-year survival of 50%.

Postoperative complications can include neurogenic bladder, wound infection, fecal incontinence, retrotumoral abscess and fecal fistula.

**Update on Adhesion Prevention**

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**Introduction**

Adhesions remain a significant source of morbidity and their prevention would significantly aid medical care. All abdominal surgical procedures have the potential for creating adhesions. In the absence of surgery, abdominal and pelvic infections and therapy, such as peritoneal dialysis, may incite the inflammatory cascade. Clearly, the optimal solution is that of prevention. Diminishing the deposition of fibrin and enhancing fibrinolysis without interfering with wound healing are the goals. This may be achieved primarily by four means: 1) mechanical bowel fixation (e.g. long tubes, suture pexy) to promote "friendly" or "benign" adhesions which will not lead to obstruction; 2) systemic pharmacologic therapy (e.g. anti-inflammatory medications); 3) intraperitoneal therapy or barriers (e.g. carboxymethylcellulose, sodium hyaluronate, irigants); and 4) local factors (e.g. surgical technique, foreign bodies) (Table 1). While none of these will completely prevent adhesions, several have been found to be promising in retrospective and prospective studies.

**Table 1. Prevention Methods**

<table>
<thead>
<tr>
<th>Operative Techniques (local factors)</th>
<th>Gentle handling of tissue</th>
<th>Avoidance of ischemia</th>
<th>Avoidance of infection</th>
<th>Hemostasis</th>
<th>Avoidance of foreign bodies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical Bowel Fixation</td>
<td>Suture pexy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Noble or Childs plication)</td>
<td></td>
<td></td>
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<tr>
<td>Lumenal plication (Long tubes- ie.Baker or Gowen tubes)</td>
<td>Mechanical Barriers</td>
<td>ePTFE (Gore-tex)™</td>
<td>oxidized regenerative cellulose (Intraceed R)</td>
<td>sodium hyaluronate and carboxymethylcellulose (Seprafilm™)</td>
<td>Pharmacologic (systemic)</td>
</tr>
</tbody>
</table>

**Mechanical Bowel Fixation**

Mechanical bowel fixation techniques have been attempted internally and externally. The most common external techniques are tacking the bowel to the peritoneum (especially with stomas), and suture pexy of the small bowel loops and mesentery in an anatomically favorable position (Noble or Childs-Phillips procedure). While these have some limited success in reducing the incidence of recurrent obstruction, they are associated with serious and frequent complications. These include enteric leaks, fistulas, sepsis and increasing the difficulty of reoperation. The use of a long tube (Baker tube) to intumously stent the bowel has also been evaluated. Again, the improvement is minimal, and complications include pneumonia, intussusception, and inability to remove the tube may occur. Close and Christensen have compared the Childs-Phillips plication to Baker tube placement, and to adhesiolysis alone. Overall, the incidence of recurrence for SBO was low for all three groups, although highest for the adhesiolysis group (6.5%). The benefit of pexing or stenting is minimal since the potential of the associated complications, they are generally not recommended for uncomplicated adhesive bowel obstructions. Some cautious consideration may be given for patients suffering from multiple episodes.

**Systemic Pharmacologic Therapy**

Systemic therapy in an attempt to modify the inflammatory response has been investigated. Steroids, non-steroidal (NSAID) and aspirin have reduced the incidence of adhesions in-vitro and in-vivo. A recent prospective trial of an antithrombus adjunct (Seprafilm™) also evaluated the use of steroids. There was a significant reduction in adhesions in patients receiving steroids. MUZII et al compared the use of low dose and high dose aspirin to a control group. The reduction in adhesion formation was greatest in the low dose aspirin group (46% compared to 77% high dose, 100% control). The peritoneal levels of thromboxane A2 were reduced most in the low dose aspirin group, and prostacyclin was reduced only in the high dose group. These findings may help explain the superiority of the low dose aspirin. Similar effects have been noted with steroids and NSAID's. NSAID's may...
reduce adhesion formation by inhibiting the arachidonic acid metabolites of the inflammatory mediators. As explained by deZerega, though, ischemic surgical surfaces which are at greatest risk for adhesion formation, would not be affected by systemic alterations in the inflammatory events. Associated side effects include bleeding and poor wound healing with resultant anastomotic disruption and incisional dehiscence.1-12 Currently, their routine use is not recommended.

Inhibitors of collagen synthesis are now available and are being studied. Halofuginone inhibits collagen type I synthesis, the type involved in scar formation. Nagler et al. administered Halofuginone systemically and intraperitoneally in an animal model.13 The number and severity of adhesions were reduced significantly in both groups given Halofuginone. In-vitro, Halofuginone reduced gene expression and synthesis of collagen type-I. The synthesis and levels of collagen type III, important in structural proteins, were not altered.13 Collagen inhibitors, therefore, may decrease the formation of scar without inhibiting the strength of healing. Any therapy that impacts the inflammatory cascade and fibrinolysis has the potential to interfere with normal healing. Therefore, further studies are necessary to validate these findings and assess the safety of their use.

INTRAPERITONEAL THERAPY

Some pharmacologic therapy may be administered directly to the peritoneal surfaces. Halofuginone has been discussed previously. Intraperitoneal and intravenous tPA is also being evaluated to augment fibrinolysis. The aim is to tip the balance of which may reduce the severity of adhesions. Primarily, these membranes and solutions are examples of treatments that have been evaluated.14 Their individual effectiveness appears to function of how slowly they are absorbed from the peritoneum. Hence PEG and Dextran demonstrate the greatest reduction in adhesion formation perhaps as a result of the temporary ascites they create. They have been studied extensively in the gynecologic volume overload and ascitic leaks. They create. They have been studied extensively in the gynecologic model.13 The number and severity of adhesions were reduced in-vitro, the type involved in scar formation. Nagler et al administered Halofuginone systemically and intraperitoneally in an animal model.13 The number and severity of adhesions were reduced significantly in both groups given Halofuginone. In-vitro, Halofuginone reduced gene expression and synthesis of collagen type-I. The synthesis and levels of collagen type III, important in structural proteins, were not altered.13 Collagen inhibitors, therefore, may decrease the formation of scar without inhibiting the strength of healing. Any therapy that impacts the inflammatory cascade and fibrinolysis has the potential to interfere with normal healing. Therefore, further studies are necessary to validate these findings and assess the safety of their use.12

The use of barriers and irrigants may prevent the apposition of traumatized surfaces during initial healing. Membranes and gels have been developed to function as barriers and reduce postoperative adhesions. The ideal barrier would remain in place long enough to prevent adhesions between traumatized surfaces, yet not be permanent so as to allow normal healing. Harris et al. evaluated a rat model regarding the kinetics of adhesion formation.14 They found that adhesion formation decreases significantly after 36 hours. They postulate that this is the critical time that barriers should be present for maximal effectiveness. Fibrin glue, hyalurondisaccharide membranes and gels, and cellulose membranes (Seprafilm, Interceed) have been the most commonly studied barriers. Fibrin glue was originally based on autologous fibrinogen or pooled cryoprecipitate. Autologous fibrinogen was cumbersome to procure, and cryoprecipitate had the associated transfusion complications.11 Artificial fibrinogen has been developed which is devoid of these problems. M embrane barriers such as oxidized regenerated cellulose (ORC, Interceed) and haluronic acid carboxymethylcellulose (HA-CMC, Seprafilm) are being used with increasing frequency. They are absorbed within 7 days and do not invoke an inflammatory reaction. M etabolic hemostasis is required because ORC is not effective in the presence of blood or other fluids. HA-CMC does not suffer from the same limitation and may offer an advantage for this reason.14 M ost commonly, these barriers are placed between the abdominal incision and the bowel, or in the pelvis. Each of these barriers has been successful in reducing adhesions locally in animal models and humans. Seprafilm® (Genzyme, Cambridge, MA) is the only product with FDA approval for use in the abdominal cavity. Presently, phase III trials are continuing to determine if there is a reduction in the incidence of complications such as infertility and bowel obstruction.

Peritoneal irrigation can act as a barrier by lubricating the surfaces and may affect the formation of adhesions. There is conflicting data regarding this issue. Dextran, hyaluronic acid, phosphate buffered saline, polyethylene glycol (PEG), Lactated Ringers, and hyperosmolar diylates are examples of solutions that have been evaluated.14 Their individual effectiveness appears to function of how slowly they are absorbed from the peritoneum. Hence PEG and Dextran demonstrate the greatest reduction in adhesion formation perhaps as a result of the temporary ascites they create. They have been studied extensively in the gynecologic literature with mixed results. The complications have included volume overload and ascitic leaks.

Each of these barriers may also prevent the formation of "functional adhesions" such as those that seal anastomotic leaks. Also, these membranes and solutions are not advised when malignancy is present as their effect on tumors and the body's response is not yet known.

LOCAL FACTORS

There are many simple techniques all surgeons should be aware of which may reduce the severity of adhesions. Primarily, these involve minimizing the presence of foreign bodies and trauma to the peritoneal surfaces. Gentle handling of tissues, lysing minimal adhesions, thereby reducing the amount of raw surfaces, judicious use of prosthetic material, including suture, and modifying the type used are basic tenants. Common practices such as suturing the peritoneum, using surgical gloves with talc and using non-absorbable suture should be eliminated entirely. There is clear evidence that these techniques are unnecessary and promote adhesions.20

When it is necessary to use prosthetic material, such as mesh, there are simple maneuvers that may reduce the inflammatory reaction and the subsequent formation of adhesions. Modifications in the mesh, which reduce tissue ingrowth, include lack of matrix in the material (Gore-tex), use of absorbable mesh (polyglactin or polyglactin lined polypropylene) and interposition of a barrier between the mesh and viscera (omentum). Recently, a mesh with an adhesion material bonded to it (SepraMesh®; Genzyme, Cambridge, MA) has become available.21

Another modification of surgical technique aimed at reducing operative trauma is laparoscopic surgery. Its use in animal models and humans with respect to the development of adhesions has been evaluated. Most studies have demonstrated diminished severity of adhesions, as well as fewer episodes of bowel obstruction. Laparoscopic surgery has also been performed as therapy in bowel obstruction and infertility safely and with excellent success in carefully selected patients. It is clear, though, that obstruction may still occur in patients undergoing laparoscopic procedures. The sites of adhesion formation include, but are not limited to, the areas of anastomoses, and port sites. So although laparoscopic surgery is referred to as minimally invasive, it is not without associated problems related to peritoneal trauma.21

CONCLUSION

Intra-abdominal adhesions continue to be a frequent source of morbidity in the surgical population. Careful surgical technique and the use of emerging technology may decrease the occurrence of adhesions and their complications.

REFERENCES

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Intraperitoneal Therapy

Some pharmacologic therapy may be administered directly to the peritoneal surfaces. Halofuginone has been discussed previously. Intra-peritoneal and intravenous tPA is also being evaluated to augment fibrinolysis. The aim is to tip the balance toward decreased fibrinogen deposition and reduced platelet aggregation and decreasing the amount of scar tissue.

Each of these barriers may also prevent the formation of "functional adhesions" such as those that seal anastomotic leaks. Also, these membranes and solutions are not advised when malignancy is present as their effect on tumors and the body's response is not yet known.

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References