RECONSTRUCTION OF THE PELVIC FLOOR, MANAGEMENT OF THE EMPTY PELVIS Since 1948, when Brunschwig (1) described the pelvic exenteration technique, following several technical improvements and constantly increasing survival rates, pelvic exenteration became an accepted method of treatment in certain forms of female genital cancer. Today, exenterative intervention is the method of choice in the treatment of post-radiotherapy, centrally located pelvic recurrences of cervical cancer. The en-bloc resection of the pelvic organs together with a portion of the pelvic diaphragm, leaves a large defect on the pelvic floor. This defect is different from that encountered with male patients following abdomino-perineal rectum resection, where tissues are not irradiated and the peritoneum can be closed.

Management of the pelvic floor is a critical step in the reconstructive phase of pelvic exenteration. Following evisceration of the pelvic organs, the small bowel will adhere to the denuded surface of the previously irradiated pelvic floor. As some of the small bowel loops are also previously irradiated, this condition commonly leads to small bowel obstruction, fistula formation or perineal herniation; a group of symptoms called "empty pelvis syndrome". These complications carry a high mortality rate. The percent of patients developing intestinal stiulsa after exenterative surgery is generally estimated at 15%. About half of these patients die because of this complication, many of them being tumor-free, as pointed out by Orr and co-authors (2).

The purpose of covering the pelvic floor is to keep the small bowel out of the small pelvis and to prevent its adherence to the denuded, hypoxic, potentially infected pelvic floor. Because of the major interest in this area, a large number of techniques have been utilized to manage the pelvic floor after exenteration. Some of them are historical curiosities, e.g., the steel mesh used by Schmitz (3), or the silastic breast prosthesis implanted by Sugarbaker (4) in the small pelvis to fill it in. The more commonly used techniques are: peritoneal flaps or free peritoneal patch, omental pedicle, amniotic membrane, dura mater, sigmoid colon lid, muscle flaps, synthetic absorbable and nonabsorbable mesh, and different vaginal reconstruction procedures which fill in the pelvis with healthy, well vascularized tissues.

OMENTAL PEDICLE This widely advocated and relatively simple method was described by Rutledge et al. (5). The omental pedicle formation involves detaching the omentum from the stomach and colon, dividing the right gastroepiploic artery, thus mobilizing the flap on the left gastroepiploic artery. The mobilized omentum is laid in the pelvis and fixed with a few stitches to the pelvic brim. The omentum apparently forms a carpet on the pelvic floor, preventing bowel adhesion. In addition, the omentum brings new, well vascularised tissue in the irradiated pelvis. The method has the disadvantage of allowing the small bowel loops to descend in the pelvic cavity. To prevent this, the omental pedicle technique can be combined with other methods, e.g. the use of synthetic mesh, to form a pelvic diaphragm with high tensile strength, covered with omental flap. Unfortunately, omentum is not always available for flap formation.

PERITONEUM Pertuccci (6) reported the use of peritoneum flap to reconstruct the pelvic floor. He left the perineal defect open and packed it with gauze to ensure hemostasis and to support the peritoneal diaphragm. Morley et al. (7-8) have improved this technique by closing the perineal defect. They isolated the peritoneal flap from the anterior abdominal wall. The flap has its base on the distal part of the abdominal wall so that it can be rotated into the pelvis. They were also successful in using a free peritoneal patch as a pelvic lid.

SYNTHETIC MESH A variety of synthetic absorbable or nonabsorbable materials have been used for pelvic floor reconstruction: Polyglactin 910 (Vicryl), Marlex, Teflon, Ivalon or Gore-Tex. These materials not only separate the bowel loops from the pelvic floor, but also keep them elevated out of the pelvis. Non-absorbable mesh serves as a firm diaphragm, but it cannot be used alone, because it tends to form adhesions. This disadvantage may be overcome by covering the mesh with an
omentum layer. The Vicryl mesh is probably the most popular among the absorbable synthetic materials. Promising results were published by Buchsbaum et al. (9) and Clarke-Pearson et al. (10). Some surgeons feel, however, that after the absorption of the mesh, the intestines will fall into the pelvis. Serial examinations after 6 and 12 months showed no prolapse, the bowels remained at the level where the Vicryl mesh was initially placed. Despite the absorption of the mesh, the granulation and fibrosis occurring on and under the mesh matrix results in the formation of a permanent pelvic diaphragm.

OTHER METHODS The current improvements in techniques for performing pelvic exenteration have made the procedures relatively safe, so that an increasing number of exenterations are performed with vaginal reconstruction. Numerous vaginal reconstruction techniques have been described. Most of them, such as the rectus abdominis, pudendal thigh, fasciocutaneous flap, gracilis, cecal, sigmoid, or omentum with split thickness skin graft neovagina, are used for pelvic reconstruction and treat the empty pelvis syndrome, as they fill the pelvic cavity with viable nonirradiated tissue.

PELVIC HERNIAS The promontorium and the linea terminalis constitute the pelvic rim. All hernias located distal to this line are "pelvic hernias." These hernias are rare, mainly because of: a) the structure of the pelvis: large bones, strong ligaments and muscles, and b) the inclination of the pelvis; the angle between the plane of the pelvic inlet and the horizontal plane is about 60°, so that the abdominal pressure is mainly on the inguinal region, and not on the bottom of the pelvis. Pelvic hernias occur mainly in cachectic, elderly, or in contrast obese patients, especially women. All foramen of the pelvis are potential hernial orifices. These are usually small hernias. As the pelvis is surrounded with a thick muscle and fatty tissue layer, the hernia usually remain asymptomatic unless they are strangulated. If they are asymptomatic they constitute an accidental intraoperative finding for the gynecologist. If they are strangulated, the patient is usually operated for ileus of unknown origin and the exact diagnosis is made intraoperatively. Pelvic hernias occur in the obturator fossa, the greater and lesser sciatic foramen and the perineum.

OBTURATOR HERNIA The hernial orifice is the canalis obturatorius on the upper part of the membrana obturatoria, where the obturator nerve and vessels leave the pelvis. If this aperture is dilated, it is protruded by small bowels. The hernial sac is covered by the huge muscular mass of the pectineal and adductor muscles, and therefore cannot be palpated. Unless strangulated, it is encountered only intraoperatively.

TREATMENT The canalis obturatorius is dilated bluntly and the hernial content is reduced in the abdomen. The intestine should be carefully examined to exclude necrosis. The simplest hernial repair is the Kocher procedure. The hernial sac (peritoneum) is pulled "invaginated" in the abdominal cavity, ligated and resected at its neck. The stump blocks the orifice. The peritoneum can be duplicated. If the hernial orifice is large, more sophisticated methods such as pectineus muscle plasty or prosthetic repair will be required.

SCIATIC HERNIA The hernial orifice is on the territory of foramen ischiadicum majus. Depending on location relative to the piriformis muscle, the sciatic hernia has two forms: the supra- and infrapiriformis hernia. The hernial sac is covered by the glutaeus muscles and glutaeal fat, making diagnosis difficult. Asymptomatic hernias are only encountered by gynecologist intraoperatively.

TREATMENT In the case of small hernia, the Kocher "invagination" procedure described above is sufficient. In the case of large hernias, prosthetic hermioplasty is needed.

PERINEAL HERNIAS They occur through the pelvic diaphragm and may be anterior or posterior to the superficial transverse perineal muscle. In women, the anterior perineal hernia passes into the labia major and can be confused with a Bartholin cyst. The posterior perineal hernia enters the ischiorectal fossa near the vagina.

TREATMENT The hernial orifice is dilated bluntly, the hernial sac content is reduced in the abdomen, the sac extirpated and the hernial orifice on the levator muscles sutured. If the defect is large, a prosthesis plasty may be necessary.

REFERENCES