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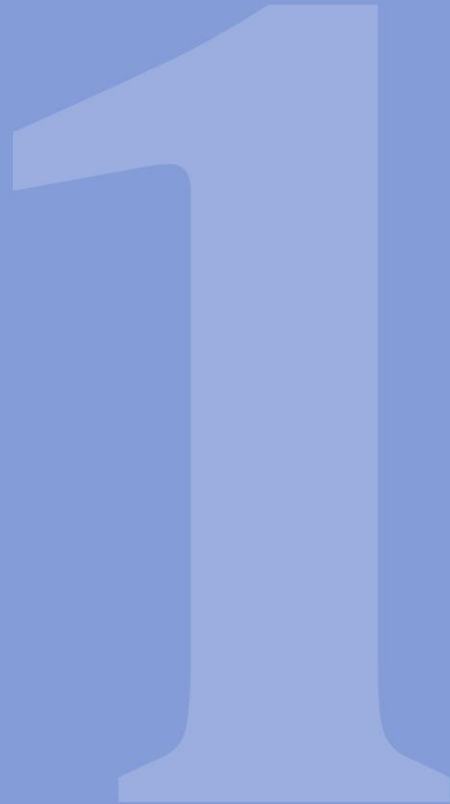
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Part 1

Plastic Reconstructive Surgery

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1 Fundamentals and Principles

1.1 Etiology of Vulvovaginal Defects

D. Ulrich

There are many different causes of vulvar defects. Tumors of the vulva are the main cause. They represent about 5% of all malignant disorders of the female genital system and about 1% of all malignancies in women. Vulvar carcinomas are observed increasingly often after the fifth or sixth decade of life (► Fig. 1.1). The modified radical vulvectomy as described by Taussig (1940)¹² and Way (1948)¹³ involves mobilization of a large composite flap of skin and fatty tissue and en bloc resection of the regional lymph tissue together with the primary tumor and adjacent vulvar tissue. Yet, the radical vulvectomy with separate bilateral inguinal lymphadenectomy is also an established surgical procedure.

Advances in surgical treatment and perioperative patient care now allow patients with extensive carcinoma of the vulva that has spread to adjacent organs, such as the urethra, urinary bladder, and/or rectum, to undergo extensive tumor surgery, provided that these patients are in good general health and remote metastases have been excluded. This surgery generally involves anterior, posterior, or total exenteration combined with a radical vulvectomy and an inguinofemoral lymphadenectomy, which leaves large defects (► Fig. 1.2).

In recent decades, the prevalence of vulvar intraepithelial neoplasia has increased significantly, especially in young women. In diffuse disease, what is known as a skinning vulvectomy may be considered for treatment. Rutledge and Sinclair first described the surgical procedure in 1968,⁹ which creates a defect only at the level of the dermis (► Fig. 1.3). The operation can be regarded as a more conservative method in multifocal diffuse vulvar carcinomas in situ. Compared with a total vulvectomy, the procedure yields a far better cosmetic result, and sexual sensation is less impaired. The intervention nonetheless often places a significant emotional burden on the patients, who are often very young.

Malignant melanomas account for about 3% of malignant carcinomas of the vulva and require extensive resection, depending on their stage (► Fig. 1.4).

Vascular malformations or hemangiomas can require surgical correction in the region of the vagina and vulva in children or later in adults (► Fig. 1.5). Other congenital deviations such as vaginal atresia can also require early genital reconstruction.



Fig. 1.1 Extensive squamous cell carcinoma of the vulva.

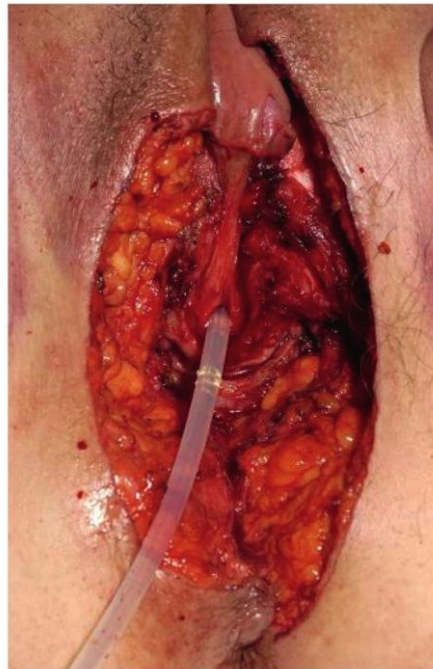


Fig. 1.2 Posterior exenteration with vulvectomy.

1.1 Etiology of Vulvovaginal Defects

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Fig. 1.3 Skinning vulvectomy.



Fig. 1.4 Malignant melanoma of the vulva.



Fig. 1.5 Venous malformation of the vulva.

Aside from malignant disease, extensive vulvar defects can also result from necrotizing fasciitis (► Fig. 1.6). The increase in shaving and piercing in the genital region has coincided with an increased prevalence of this disorder.

Perineal lacerations also warrant mention as a cause of vulvoperineal defects. These soft-tissue injuries occurring during vaginal delivery are divided into four degrees of severity (► Table 1.1).

The prevalence of first- or second-degree perineal lacerations is said to be about 10 to 15%. More severe



Fig. 1.6 Defect secondary to necrotizing fasciitis.

Fundamentals and Principles

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Table 1.1 Classification of soft-tissue injuries

Degree	Findings
I	Laceration of the skin and subcutaneous tissue in the region of the posterior commissure of the labia majora
II	Like first degree but with additional laceration of the superficial musculature of the rectovaginal septum, that is, the superficial and deep transverse perineal and bulbocavernosus muscles
III	Like second degree but with additional laceration of the external anal sphincter (degree IIIa: <50%; degree IIIb: >50%) and internal anal sphincter (degree IIIc)
IV	Like third degree but with additional laceration of internal anal sphincter and opening of the rectum

perineal lacerations (third degree or higher), occurring in about 1% of all vaginal deliveries, are the most common cause of anal incontinence symptoms and severely impair the patient's quality of life. Therefore, they should be treated promptly in the immediate postpartum phase. Nonetheless, the sequelae of a perineal laceration, especially scarring and residual soft-tissue defects, often cause physical symptoms that require surgical intervention. The same applies to defects or scarring occurring secondary to surgery such as episiotomy, trauma, or burns (► Fig. 1.7).



Fig. 1.7 Painful scar following episiotomy (left) and soft-tissue defect following second-degree perineal laceration (right).

1.2 Principles of Vulvar Reconstruction

D. Ulrich

External identification of female sex is made on the basis of the primary and secondary sex characteristics. Aside from functional deficits, the surgical treatment of vulvar malignancies or trauma that creates an extensive defect in this region often has a severe impact on the affected patient's body image and self-confidence. Reconstructive measures to restore the morphology of the vulva are repeatedly recommended, yet often they are not routinely performed. Although numerous highly developed surgical techniques for the reconstruction of the female breast have become a part of routine clinical practice, the technique of reconstructing physiologic vulvar and vaginal anatomy to address congenital deviations, tumor resections, or extensive soft-tissue defects is far less advanced.

Reconstructive genital surgery must focus particularly on the restoration of the physiologic features required for reproduction and excretion. Regardless of whether the procedure involves primary reconstruction in the vulvar region or secondary correction of functional impairments following surgery or radiation therapy, the goal of the operation should consist in achieving a balance between the restoration of physiologic anatomy and natural function, on the one hand, and healing the disorder with a high degree of patient satisfaction, on the other. This is especially true in young patients who can suffer severe psychosexual impairments as a result of previous radical gynecologic surgery.

Additionally, one must bear in mind that malignancies in the region of the vulva can frequently recur. Therefore, when a local flap is indicated, care should be taken to select a method that will later allow other local or regional reconstruction options. For example, most patients do not require primary reconstruction of the vulva with V-Y flaps, but the desired result can often be achieved with a pudendal thigh flap. This means that reconstruction with a V-Y flap remains an option in the event of a recurrent malignancy. Using a V-Y flap for primary reconstruction on the other hand usually precludes later reconstruction with a pudendal thigh flap.

In recent years, the fasciocutaneous flap has increasingly gained favor over the myocutaneous flap in the treatment of small- to medium-sized defects of the vulva and vagina. Myocutaneous flaps add bulk due to their volume and as a rule they are not sensitive. Additionally, patients are often bothered by the visible scars at their donor site on the thigh or abdomen. Yet, where there are extensive tissue defects with large wound cavities, recurrences, and prior radiation therapy, a myocutaneous flap remains the first choice. These flaps are used wherever the depth of the defect requires a thicker flap or the excision is so extensive that a local fasciocutaneous flap will no longer suffice. With their large arc of rotation, they provide a good means of reconstruction. The myocutaneous flap also ensures sufficient blood supply in tissue that is often less well perfused as a result of radiation therapy or radical tumor surgery.

Often, combinations of different flap techniques are required to close complex defects; these may also include fasciocutaneous and myocutaneous flaps. In essence, the ultimate success depends on proper patient selection, proper choice of surgical technique, and proper application of that technique.

Note

Important factors in successful closure of a defect:

- Patient selection.
- Proper choice of surgical technique.
- Proper application of the technique.



According to Salgarello et al,¹⁰ the ideal flap for reconstruction of the vulva and vagina should:

- Fill the defect with a well-vascularized piece of tissue of similar thickness.
- Include a variable amount of tissue for closing smaller and larger defects.
- Guarantee restoration of function.
- Not cause any symptoms when the patient sits or walks.
- Have a natural, aesthetic appearance.
- Include sensory innervation.
- Allow reconstruction in a single procedure.

1.3 Etiology of Penoscrotal Defects

G. Djedovic, U. M. Rieger

Cutaneous soft-tissue defects in the penoscrotal region often occur as a result of trauma, infection, neoplasia, or surgery. Trauma is the most common cause in younger patients. With respect to prevalence, penetrating and blunt trauma each account for about 45%, although burns (10%) also warrant mention. Infections constitute the second largest group of causes of penoscrotal defects. Aside from complicated wound infections and acne inversa lesions, Fournier gangrene, a mixed bacterial infection that can prove fatal, warrants particular mention. Persons with a compromised immune system, diabetes mellitus, immunosuppression, or poor bodily hygiene are particularly at risk. Tumors primarily include squamous cell carcinomas, which when resected often lead to partial or complete loss of the scrotum or penis.

Note

Causes of penoscrotal defects:

- Trauma.
- Infections.
- Neoplasms.
- Iatrogenic causes.



1.4 Principles of Penis and Scrotum Reconstruction

G. Djedovic, U. M. Rieger

Mutilations in the genital region and also partial or complete loss of the scrotum or penis impair not only the physical and emotional well-being of the patient but often his relationship to his partner as well. The goal of penis and scrotum reconstruction is therefore the restoration of the outward appearance coupled with a functional reconstruction that, under favorable circumstances, will again permit sexual interaction.

Fundamentals and Principles

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Further Reading

- [1] Barrena N, Wild R, Mayerson D, López JL. Intraepithelial neoplasms of the vulva: treatment by skinning vulvectomy. *Rev Chil Obstet Ginecol.* 1987; 52(5):281–285
- [2] Basoglu M, Ozbey I, Atamanalp SS, et al. Management of Fournier's gangrene: review of 45 cases. *Surg Today.* 2007; 37(7):558–563
- [3] Beemer W, Hopkins MP, Morley GW. Vaginal reconstruction in gynecologic oncology. *Obstet Gynecol.* 1988; 72(6):911–914
- [4] Fanfani F, Garganese G, Fagotti A, et al. Advanced vulvar carcinoma: is it worth operating? A perioperative management protocol for radical and reconstructive surgery. *Gynecol Oncol.* 2006; 103(2):467–472
- [5] Höckel M, Dornhöfer N. Anatomical reconstruction after vulvectomy. *Obstet Gynecol.* 2004; 103:1125–1128
- [6] Lee PK, Choi MS, Ahn ST, Oh DY, Rhie JW, Han KT. Gluteal fold V-Y advancement flap for vulvar and vaginal reconstruction: a new flap. *Plast Reconstr Surg.* 2006; 118(2):401–406
- [7] McCraw JB, Massey FM, Shanklin KD, Horton CE. Vaginal reconstruction with gracilis myocutaneous flaps. *Plast Reconstr Surg.* 1976; 58(2):176–183
- [8] Rettenmaier MA, Braly PS, Roberts WS, Berman ML, Disaia PJ. Treatment of cutaneous vulvar lesions with skinning vulvectomy. *J Reprod Med.* 1985; 30(6):478–480
- [9] Rutledge F, Sinclair M. Treatment of intraepithelial carcinoma of the vulva by skin excision and graft. *Am J Obstet Gynecol.* 1968; 102(6):807–818
- [10] Salgarello M, Farallo E, Barone-Adesi L, et al. Flap algorithm in vulvar reconstruction after radical, extensive vulvectomy. *Ann Plast Surg.* 2005; 54(2):184–190
- [11] Ulrich DJO, Ulrich F. Rekonstruktionen im Bereich der Vulva. In: Krupp S, Rennekampff HO, Pallua N, eds. *Plastische Chirurgie.* 32. Erg. Lfg. 12/08, VII-3, 1–20
- [12] Taussig FJ. Cancer of the vulva: an analysis of 155 cases. *Am J Obstet Gynecol.* 1940; 40:764–770
- [13] Way, S. 1948. The anatomy of the lymphatic drainage of the vulva and its influence on the radical operation for carcinoma. *Ann. R. Coll. Surg. Engl.* 3:187