SURGICAL TREATMENT OF BENIGN TUMORS OF THE HICLE

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ABSTRACT

Benign tumors of the testicle are relatively uncommon lesions, but their clinical importance is considerable because they often imitate malignant testicular neoplasms. The traditional surgical response to a solid intratesticular mass has been radical inguinal orchiectomy; however, the wider use of high-resolution ultrasonography, tumor-marker assessment, intraoperative frozen-section examination, and fertility-preserving urologic surgery has changed the therapeutic paradigm.

Introduction

Benign tumors of the testicle represent a diagnostically complex group of lesions because their clinical presentation may be indistinguishable from malignant testicular tumors. A painless palpable nodule, scrotal discomfort, incidental ultrasonographic finding, or endocrine manifestation may all lead to the discovery of a testicular mass. For many decades, radical inguinal orchiectomy was considered the standard operative method for most solid intratesticular lesions, primarily because malignant germ-cell tumors are more frequent than benign neoplasms in postpubertal males. Nevertheless, modern urology has moved toward a more differentiated surgical strategy. Small, well-circumscribed lesions with negative serum tumor markers and benign radiological features are no longer automatically regarded as indications for radical removal of the whole testis. Current European urological guidance and recent systematic reviews recognize that testis-sparing surgery may be appropriate in selected cases, especially when the lesion is small, markers are negative, the contralateral testis is absent or compromised, or the probability of benign pathology is high [1; 2].

Main part

Preoperative evaluation is the first decisive stage in selecting the appropriate surgical approach. The diagnostic algorithm usually includes clinical examination, scrotal ultrasonography, serum tumor markers, and assessment of reproductive and hormonal status. Alpha-fetoprotein, beta-human chorionic gonadotropin, and lactate dehydrogenase are essential markers, although their normal values do not absolutely exclude malignancy. Ultrasonography helps determine the size, echogenicity, vascularity, borders, and location of the lesion. Benign tumors such as epidermoid cysts may demonstrate a sharply demarcated structure and characteristic internal echogenic pattern, whereas Leydig cell tumors are often small, hypoechoic, and vascularized. However, imaging alone is not sufficiently reliable for a final diagnosis; therefore, surgical exploration with intraoperative frozen-section examination is often the key method for avoiding unnecessary radical orchiectomy [3; 4]. Studies on small

testicular masses show that a substantial proportion of such lesions may be benign, particularly when they are nonpalpable, less than 2 cm, and associated with negative markers.

The main surgical alternatives are radical inguinal orchiectomy and testis-sparing surgery, also termed partial orchiectomy or tumor enucleation. Radical orchiectomy remains obligatory when malignancy is strongly suspected, when frozen-section findings are malignant or inconclusive, or when the tumor occupies most of the testicular volume. In contrast, testis-sparing surgery is indicated when the mass is small, technically resectable, and likely to be benign. It is also especially valuable in bilateral tumors, solitary testis, prepubertal patients, men with fertility disorders, and patients in whom preservation of androgenic function is clinically significant. Paffenholz et al. emphasized that immediate orchiectomy should be avoided in carefully selected benign lesions and that testis-sparing surgery can be safely performed when diagnostic parameters support benignity [3].

The operative technique must follow oncological principles even when benign pathology is suspected. The preferred access is an inguinal incision rather than a transscrotal route, because the inguinal approach allows control of the spermatic cord and immediate conversion to radical orchiectomy if malignancy is confirmed. After delivery of the testis, the tunica vaginalis is opened and intraoperative ultrasonography may be used to localize a nonpalpable lesion. The tunica albuginea is incised directly over the mass, and the tumor is excised with a narrow rim of surrounding tissue when possible. Excessive removal of normal parenchyma should be avoided, but incomplete excision is unacceptable. The specimen is immediately sent for frozen-section examination. If the lesion is confirmed as benign, the remaining testicular tissue is reconstructed, hemostasis is secured, and the tunica albuginea is closed. If malignancy is diagnosed, radical orchiectomy is usually performed during the same operation [4; 5]. Frozen-section examination has been reported as a clinically useful method for differentiating benign and malignant lesions, although its reliability depends on the availability of experienced pathologists and adequate sampling.

Leydig cell tumors are among the most frequent benign sex cord-stromal tumors of the testis. They may present with gynecomastia, decreased libido, infertility, endocrine disturbances, or as an incidental ultrasonographic finding. Most Leydig cell tumors are benign, but malignant behavior is possible, particularly when the tumor is large, infiltrative, necrotic, cytologically atypical, or mitotically active. For small Leydig cell tumors without malignant features, testis-sparing surgery is often considered appropriate. Postoperative histology must assess tumor size, margins, vascular invasion, necrosis, mitotic activity, and paratesticular extension. If benign characteristics are confirmed, additional treatment is usually unnecessary; however, long-term follow-up is recommended because recurrence, although uncommon, has been described [6].

Conclusion

Surgical treatment of benign tumors of the testicle has evolved from a predominantly radical model toward an individualized organ-preserving strategy. Radical inguinal orchiectomy remains necessary when malignancy is suspected or confirmed, but testis-sparing surgery is now an evidence-supported option for selected benign and indeterminate small testicular masses. The success of conservative surgery depends on accurate preoperative evaluation, inguinal surgical access, complete local excision, intraoperative

frozen-section examination, final histopathological verification, and careful postoperative surveillance. The main clinical objective is not merely removal of the tumor but achievement of oncological safety while preserving hormonal, reproductive, and psychosocial functions. In this respect, modern management of benign testicular tumors reflects a broader surgical principle: treatment must be radical enough to be safe, but conservative enough to protect the patient's long-term quality of life.

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