Role of color-Doppler US in the evaluation of scrotal edema

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Abstract Ultrasound (US) examination in combination with color-Doppler US is the imaging modality of choice for evaluating the scrotum. Scrotal conditions are generally divided into testicular and extratesticular disorders; the latter may affect the epididymis, the spermatic cord, the tunica vaginalis, the skin and the subcutaneous tissue. The embryology of the scrotal contents is complex and has a number of anatomical and clinical consequences. We present the case of a patient with extraosseous Ewing's sarcoma of the thigh and ipsilateral scrotal swelling caused by lymphatic edema secondary to inguinal lymph node involvement. US combined with color-Doppler allowed differentiation between lymphoma or neoplastic involvement and lymphedema or vascular edema. If the US operator is thoroughly familiar with the scrotal lymphatic and vascular system, US imaging can help identify the pathogenesis of the edema and provide the clinicians and surgeons with important information.

Keywords Scrotum · Lymphedema · Color-Doppler ultrasound · Ewing sarcoma

Riassunto L'esame ecografico integrato dalla valutazione color-Doppler è l'esame di imaging più diffuso per la valutazione dello scroto. La patologia scrotale è generalmente distinta in testicolare ed extra-testicolare;

quest'ultima può localizzarsi nell'epididimo, nel funicolo spermatico, nelle guaine testicolari o in cute e sottocute. La complessa embriologia delle strutture che compongono lo scroto ha una serie di conseguenze anatomiche e cliniche. Presentiamo il caso di un paziente con tumefazione scrotale causata da un edema linfatico a sua volta secondario ad un interessamento metastatico dei linfonodi inguinali da parte di un sarcoma di Ewing extra-osseo della coscia omolaterale. L'ecografia con color-Doppler consente di realizzare una diagnosi differenziale tra interessamento linfomatoso o secondario da carcinoma e edema linfatico o vascolare. Se supportata da una corretta conoscenza delle connessioni linfatiche e vascolari, l'ecografia può inoltre permettere di individuare il meccanismo patogenetico di tale edema e di dare importanti informazioni a clinico e chirurgo.

Introduction

Ultrasound (US) examination in combination with color-Doppler study is the most widely used diagnostic tool for evaluating the scrotum. The superficial and easily accessible location of the scrotum combined with the excellent spatial resolution of US imaging and the absence of ionizing radiation are the reasons why US has become the imaging modality of choice for evaluating the scrotum. Scrotal conditions are generally divided into testicular and extratesticular disorders; the latter can affect the epididymis, the spermatic cord, the tunica vaginalis, the skin and the subcutaneous tissue. Unlike testicular disorders, extratesticular disorders are generally benign [1].

Scrotal abnormalities secondary to pathological processes developing in other organs or those which are linked to vascular (mainly venous) and lymphatic involvement are

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particularly difficult to evaluate. These abnormalities therefore necessitate familiarity with the technical aspects of US imaging as well as a thorough knowledge of the anatomy and embryologic development of the scrotum.

The embryology of the scrotal contents is complex and has a number of anatomical and clinical consequences. It should be kept in mind that the testes are supplied through a complex network of vascular and lymphatic structures which connect this organ with the upper abdomen (and particularly the paraaortic lymph nodes). This vascular and lymphatic communication exists because the testis is developed in the abdominal cavity and only in a second moment migrates through the inguinal canal into the scrotum. In contrast, venous drainage of the extratesticular structures follows the arterial vessels and is taken care of by the external pudendal vessels draining into the femoral vein, the testicular branches of the internal pudendal vein and the cremasteric veins of the inferior epigastric vein. The associated lymphatic system drains to the superficial inguinal lymph nodes [2].

For these reasons, we found it appropriate to publish this case report which describes an uncommon pathological

condition and provides information about the anatomy and embryology of the testes to be applied in clinical practice.

Case report

A 24-year-old male was referred to our department due to the appearance over 2 weeks of a scrotal swelling, which was bilateral but affecting mainly the left side. The swelling was neither painful nor tender, and the scrotum did not present with other signs of inflammation (redness, heat). On palpation, the swelling was tense elastic and homogeneous. No pulsation was visible or felt at palpation. The patient had extraosseous Ewing's sarcoma of the left quadriceps femoris muscle and had therefore been receiving chemotherapy for some months.

US imaging of the scrotum using GE LOGIQ E9 (GE Healthcare, USA) and a multi-frequency linear probe (7.2–17 MHz) showed marked thickening of the scrotal sheaths, which reached a maximum thickness of about 4 cm and were characterized by a markedly inhomogeneous echo pattern (Fig. 1). Color-Doppler US did not show increased vascularization (Fig. 2). These findings

Fig. 1 Lymphatic edema of the scrotal sheaths. US imaging: transverse scan of the scrotum and the left testicle shows thickening and inhomogeneous echo pattern of the scrotal sheaths. The deeper tissues of the testicle appear normal

Fig. 2 Lymphatic edema of the scrotal sheaths. Color-Doppler US: transverse scan of the scrotum and the left testicle shows no hypervascularization

were considered a sign of simple lymphedema caused by lymphatic obstruction, whereas secondary involvement by the sarcoma or other neoplastic diseases was excluded.

The patient was submitted to surgical removal of the Ewing sarcoma located in the quadriceps muscle of the left thigh including ipsilateral inguinal lymphadenectomy (which revealed multiple lymph node metastases). Within a few days, there was spontaneous regression of the scrotal swelling. This confirmed the hypothesis of lymphedema due to lymphatic obstruction linked to the presence of ipsilateral inguinal lymph node metastases.

Conclusions

In the presence of extratesticular scrotal abnormalities, particularly those of the scrotal sheaths, the following three conditions are most frequently included in the differential diagnosis: lymphoma, secondary tumor and edema linked to lymphatic and venous obstruction. Gray-scale US does not provide a clear differential diagnosis, as thickened scrotal walls and an inhomogeneous scrotal echo pattern are seen in all cases, while the testicles appear normal. Some authors [3] have pointed out the presence of an “onion-like” appearance; however, this image has never been observed in our practice, including the present case. The use of color-Doppler is essential as this technique shows hypervascularization in case of secondary tumor [4] or lymphoma [5]. In contrast, no increased vascularization is observed in edema caused by lymphatic or venous obstruction [6].

When a patient is suspected of having extratesticular scrotal edema due to lymphatic or venous obstruction, the next step is evaluation of the inguinal and pelvic lymph nodes and the venous blood vessels in search of possible causes of the obstruction, keeping in mind the anatomical and embryological aspects of this region.

This case report emphasizes that US combined with color-Doppler provides a differential diagnosis between lymphoma or neoplastic involvement and lymphatic or vascular edema. If the US operator is thoroughly familiar with the scrotal lymphatic and vascular system, US imaging can help identify the pathogenesis of the edema and provide the clinicians and surgeons with important information.

Conflict of interest Caterina Quiligotti, Valentina Merico and Chandra Bortolotto declare that they have no conflict of interest related to this paper.

Informed consent All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. The patient provided written informed consent to the publication of this paper and to the inclusion in this article of information and images that could potentially lead to his identification.

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