Learning objectives

Ultrasound is the primary diagnostic tool used in investigating scrotal pathologies. Our aim is to describe and illustrate images of anatomical variants, commonly encountered and rare pathologies from our day to day practice.

Background

The most common indications for performing scrotal ultrasound are pain, swelling and lumps. In the majority of patients the scan is either normal or there are incidental findings.

Ultrasound is a good diagnostic tool for identifying the pathology and is nearly 100% sensitive for detecting tumours (1), however if there is a neoplastic lesion it is not reliable in differentiating the tumour type. Solid intra-testicular lesions are usually malignant whereas extra-testicular lesions are usually benign. All focal intra-testicular low reflective lesions are malignant until proven otherwise.

Imaging findings OR Procedure details

Incidental findings, normal variants and benign pathologies:
An **undescended testis** can be anywhere along the path of descent and is most commonly found in the inguinal canal. **Figure 1** on page 11 shows an atrophic undescended testis in the left inguinal canal.

**Intratesticular cysts** are well defined and anechoic with posterior acoustic enhancement. They are usually incidental findings and can be solitary or multifocal (**Fig 2**). Extratesticular cysts are much more common than intratesticular cysts. Epididymal cysts can arise anywhere in the testis but are most commonly in the head of the epididymis. (**Fig 3** on page 13 & 4 on page 14 - This patient had a contralateral seminoma)

The **testicular appendix** is a remnant of the Mullerian duct and is located between the upper pole of the testis and the epididymal head (**Fig 5**). The appendix of the testis may be involved in torsion or there can be torsion of the appendix alone(2).

**Testicular microlithiasis** is an incidental finding at sonography. There are multiple echogenic foci without posterior acoustic shadowing (**Fig 6**). **Hydrocele** is an abnormally large collection of fluid between the layers of the tunica vaginalis and it is most common cause of painless scrotal swelling. (**Fig 7** on page 17 and **Fig 8**). **Varicocele** is abnormal dilatation of the spermatic cord veins. These vessels are usually 0.5-1.5mm with the main draining vein being upto 2mm. It is more common on the left due to the course of the left testicular vein. On ultrasound there are multiple serpinigious vessels. If seen in a patient over the age of 40, this may be secondary varicoceles and the kidneys should also be scanned. (**Fig 9 on page 19 & 10** on page 20

Late presentation of testicular torsion can result in **testicular infarct** (**Fig 11** on page 21-12). The differential diagnosis for this hypoechoic area in the testicle would be a testicular tumour. However, no doppler flow is demonstrated in this testicle in keeping with torsion or testicular infarct. This was confirmed on histology.

**Epididymo-orchitis** usually involves the epididymis alone and is enlarged with increased doppler signal and may be hypo or hyperechoic. If the testis is involved, it is diffusely enlarged with increased doppler signal and is mixed echogenicity. (**Figs 13 on page 23, 14, on page 24 15**). on page 25f this is the case it should be followed up with ultrasound to ensure resolution as this appearance can also be seen in leukaemia or **lymphoma** (**Figs 16, on page 26 17, on page 27 18** on page 28 (2).
Granulomatous orchitis is a rare condition which cannot be differentiated from testicular malignancy on imaging alone. This patient was proven to have granulomatous orchitis on histology.

(Figs 19, on page 29 20) on page 30

Neoplastic lesions:

Germ cell tumours constitute 90% of all testicular neoplastic lesions. Seminomas are the most common germ cell tumours and have the best prognosis. On ultrasound, seminomas are homogenous, hypoechoic and well defined lesions. (Figs 21, on page 31 22, on page 32 23) on page 33

The non-seminomatous germ cell tumours usually show multiple histological patterns. Unlike seminomas these usually are heterogenous, irregular masses which may be ill defined and may have echogenic foci or cystic areas within them. The following are examples of nonseminomatous germ cell tumours which were proven on histology.

• Malignant teratoma with predominantly embryonal carcinoma component (Figs 24, on page 34 25) on page 35
• Malignant germ cell tumour with combined embryonal carcinoma and seminoma (Fig 26) on page 36
• Malignant germ cell tumour- anaplastic spermocytic seminoma(Fig 27 on page 37 and Fig 28) on page 38

Non-germ cell tumours are the sex cord-stromal tumours and represent 4% of testicular neoplastic lesion.

Lymphoma (5% of testicular tumours) and leukaemia may also involve the testis. (Figs 23-25)

Other rarer tumours and metastatic deposits may also be seen in the testes. Figure 29 on page 39 shows a tumour in the testicle which was a schwannoma on histology.
Fig. 1: An undescended testicle in left inguinal canal
Fig. 2: Intra-testicular cysts
**Fig. 3:** An epididymal cyst
Fig. 4: The same patient as Fig 3, showing a contralateral intratesticular tumour, proven to be a seminoma at histology
Fig. 5: Appendix of the testis
Fig. 6: Testicular microlithiasis
Fig. 7: Transverse section of left sided hydrocele
Fig. 8: Sagittal section of a left hydrocele
Fig. 9: Varicocele
Fig. 10: Varicocele
Fig. 11: Hypoechoic area in the left testicle which demonstrates no colour flow in keeping with testicular infarct.
Fig. 12: Same patient as Fig 11
Fig. 13: The right testicle shows patchy echotexture and is enlarged when compared with the left testicle.
**Fig. 14:** Same patient as in Figures 13&15. Image shows increased doppler flow in the right testicle when compared with the left.
Fig. 15: Same patient as in Figures 13&14.
Fig. 16: Sagittal section of the right testicle showing a diffusely enlarged testicle which is hypoechoic. On resection this was proven to be a Non-Hodgkin Lymphoma. Doppler imaging shows increased blood flow (figure 18).
Fig. 17: Same patient as Fig 16
Fig. 18: Same patient as Figs 16-17
**Fig. 19:** Ill defined, hypoechoic area in the right testicle with increased blood flow. This was confirmed to be granulomatous orchitis on histology.
Fig. 20: Same patient as Fig 19
**Fig. 21:** Hypoechoic, well defined lesion in the left testicle. Histology confirmed a classical seminoma.
Fig. 22: Hypoechoic, well defined mass in right testis. Confirmed to be a seminoma on histology
Fig. 23: Hypoechoic lesion in the left testicle which was a seminoma on histology
Fig. 24: Mixed echogenic tumour with cystic areas. Histology showed this to be a malignant teratoma with a predominant component of embryonal cell carcinoma.
Fig. 25: Same patient as in Fig 24. Image showing the tumour not to be particularly vascular.
**Fig. 26:** Hypoechoic tumour in the left testicle, which is less well defined when compared with the images of the seminoma. On Histology this was shown to be Malignant germ cell tumour with embryonal carcinoma and seminoma components.
**Fig. 27:** Enlarged left testicle which is replaced by tumour. The tumour is mixed echogenicity with cystic components. The histology for this tumour was consistent with an anaplastic spermocytic seminoma
Fig. 28: Transverse section of tumour shown in Fig 27.
Fig. 29: Large tumours replacing most of the testicle. On histology this was proven to be a Schwannoma.
Conclusion

Ultrasound is an invaluable diagnostic tool in identifying testicular pathologies and anatomical variants. A normal ultrasound scan excludes neoplastic lesions.

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References

Diagnostic capabilities of high-resolution scrotal ultrasonography:
prospective evaluation
PMID:3882978

Sonography of the scrotum
PMID:12616012