Introduction

Vivid recitation of anatomy and physiology is paramount to take stock of swelling(s) of any of the structures of the scrotum, the salient features of which formed the talk through illustrations[1]. Swelling, turgescence or tumefaction is a transient abnormal enlargement of a body part and/or its anatomical constituents not caused by proliferation of cells[2]. It is caused by accumulation of fluid in tissues. It can occur through the body (generalized), or a specific part or organ can be affected (localized). Scrotum being one of the pre-eminent parts.

The scrotal swellings[3-5] are menacing challenging proposition affecting any of its structures starting with affliction of the skin in the form of angioderma[6]; acquired angioderma (AAE)[7] and hereditary angioderma (HAE)[8] and lichen simplex chronicus (LSC)[9]. Besides, inflammation of the testis, the orchitis[10,11], epididymitis, the epididymo-orchitis[12,13], and/or epididymo-orchitis[14,15], pampiniform plexus, the Varicocele[16], testicular torsion[17], and collection of fluid in the tunica vaginalis testis, the Hydrocele[18] and exit/ slipping of small bowel into the scrotum, the inguinal hernia are its other presentations. It is, therefore, worthwhile to take stock of these conditions by their salient clinical presentation, diagnosis criteria including investigation like Ultrasonography[19], Ultrasonic colour Doppler imaging[20] and magnetic resonance imaging (MRI)[21,22] to form the perspective clinical diagnosis. Accordingly, their cardinal briefs are defined in the adjoining tables (table 1 to 4) for at a glance evaluation.

Scrotal swellings of dermis and sub-cutaneous tissue

Angioedema (Figure. 1a), lichen simplex chronicus (Figure. 2a & b): Nomenclature, clinical variants, salient presentation and diagnostic criteria are outlined in Table 1.
Figure 1a: Scrotal swellings: Acquired angioedema affecting the scrotum.

Figure 2a,b: Scrotal swellings: Depicting lichen simplex chronicus.

Table 1: Scrotal Swellings: Angioedema and Lichen simplex chronicus (LSC).

<table>
<thead>
<tr>
<th>Nomenclature</th>
<th>Clinical variants</th>
<th>Presentation</th>
<th>Diagnostic criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angioedema[6], angiooedema, Quincke’s edema, angioneurotic edema</td>
<td>Acquired angioedema (AAE)[7] Recurrent transitory swelling affecting the face, lips, tongue, limbs, and genitals, mediated by angiotensin-converting-enzyme inhibitor (ACE inhibitor)</td>
<td>In addition to the clinical picture supplement of haemogram, serum, electrolytes, liver and kidney functions are mandatory</td>
<td>Clinical as well as laboratory test, inhibitor of complement enzyme, C1 esterase (C1INH) for HAE[23]</td>
</tr>
<tr>
<td>Rapid swelling, edema of the dermis, subcutaneous tissue, mucosa and sub mucosal tissues.</td>
<td>Hereditary angioedema (HAE)[8] Caused by a genetic mutation inherited in an autosomal dominant form, distinguished by the underlying genetic abnormality.</td>
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<tr>
<td>Lichen simplex chronicus (LSC)[9,24]</td>
<td>Lichen amyloidosis[10,25,26] The re-crossed keratinocytes that forms keratinocytes-derived amyloid in the dermis.</td>
<td>Intense, intermittent pruritus, scrotal erythema and edema Erectile dysfunction (ED)[27]</td>
<td>Stable pruritic plaque(s), marked by thickening, pigmentation exaggerated skin markings, the lichenification complemented by histopathology.</td>
</tr>
</tbody>
</table>

Scrotal swellings of the contents of the scrotum Orchitis, Epididymitis and Epididymo-orchitis (Figure 3)
The origin of nomenclature, clinical variants, presentation and diagnostic criteria are succinctly defined in the adjoining (table 2)
Table 2: Scrotal Swellings: Orchitis, Epididymitis and Epididymo-orchitis.

<table>
<thead>
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<tr>
<td>Inflammation of the testicles caused either by bacteria or virus, affecting one or both</td>
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<tr>
<td>Epididymitis[11,12,28,30] Discomfort or pain[31]</td>
<td>Acute, Chronic</td>
<td>Chills, low-grade fever, Pain/discomfort in the pelvic area, painful, red, warn and swollen scrotum, pain and tenderness in the testicles, enlarged groin lymph nodes, painful, frequent urination or bowel movements, painful intercourse and ejaculation.</td>
<td>Clinical Vide-infra see below</td>
</tr>
<tr>
<td>Epididymo-orchitis [14,15,32,33]</td>
<td>Acute gonococcal[34] / non-gonococcal urethritis (NGU)[35-40]/ non specific urethritis (NSU), Chronic</td>
<td>Rapid swelling of epididymis and testis in a short course, a day or so. Painful, enlarged, tender and red scrotum.</td>
<td>Gram Stain of Urethral is charge with Intracellular Neisseria, gram-negative diplococcai Chlamydia trachomatis[41] Testing Sensitivity in Midstream urine specimens</td>
</tr>
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</table>

Varicocele and testicular torsion: The origin of nomenclature, clinical variants, presentation, and diagnostic criteria are shown for at a glance diagnosis in (table 3)

Table 3: Scrotal Swellings; Varicocele; Testicular torsion

<table>
<thead>
<tr>
<th>Diagnosis</th>
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<tr>
<td>varicocele[16,28,42]</td>
<td>Idiopathic /Pri-mary varicocele Secondary varicocele</td>
<td>Visible/palpable enlarged veins Dragging/ aching scrotal pain/ heaviness Atrophy of the testicle(s) Benign prostatic hyperplasia (BPH) Infertility[43,44]</td>
<td>Changing levels of testosterone ColorDoppler ultrasound (CDU)[46] presence of a venous plexus and the sum of the diameters of veins in the plexus change of flow on Valsalva maneuver / manoeuvre (Fig. 4, fig. 5)</td>
</tr>
<tr>
<td>enlargement of pampiniform plexus resulting from engorgement / swollen veins apparent as a testicular swelling, variable age group being 13 - 30 years. Classified into Grade 1: Smallest size Grade 2: Size between Grade 1 and 2 Grade 3: Largest size</td>
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<tr>
<td>Testicular torsion[17,47-49]</td>
<td>Congenital</td>
<td>Sudden, severe, testicular pain and tenderness in the groin and lower abdomen</td>
<td>Clinical color ultrasound scan of the scrotum, eliciting absence of blood flow in the twisted testicle[40]</td>
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<td>Twisting of the spermatic cord resulting in ischemia of the testicles,</td>
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Hydrocele Testis and Inguinal Hernia: There nomenclature’s origin clinical variants, presentation, and diagnostic criteria are shown in table 4, Fig 4, 5 (Figure 6a & b)
Scrotal Swellings

Figure 4: Bilateral testis showing normal flow.

Figure 5: Color Doppler image showing multiple veins dilated and filling up on valselva maneuver. The pampiniform vein measures 4 mm.

Figure 6a,b: Scrotal swellings: Hydrocele depicting scrotal swelling.
### Table 4: Scrotal Swellings: Hydrocele Testis and Inguinal Hernia.

<table>
<thead>
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<th>Diagnosis</th>
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<tr>
<td>Hydrocele Testis[^51-53]</td>
<td>Primary hydrocele</td>
<td>Soft, non-tender, large swelling, non palpable testis</td>
<td>Ultrasound mandatory for testicular visualization</td>
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<td></td>
<td>Secondary hydrocele due to disease(s) of testis. Acute/chronic epididymo-orchitis, Torsion of testis, Testicular tumor, Hematocele, Filarial hydrocele, Post herniorrhaphy, Hydrocele of an hernial sac</td>
<td>Fluctuating, non-reducible swelling, No cough impulse, It is more of a symptom than an actual pathological entity, Palpation of testis impossible except for funicular and encysted hydrocele, Trans-illumination elicitable</td>
<td>Diffusion-weighted MRI of the testis[^54], Apparent diffusion co-efficient (ADC), Reduced ADC values of testis, indicating reduced diffusion of the testis, with an increasing amount of fluid (Figure 7a &amp; b)</td>
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<tr>
<td>Infantile hydrocele</td>
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<tr>
<td>Congenital hydroceles</td>
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<tr>
<td>Encysted hydrocele of the cord</td>
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<tr>
<td>Inguinal hernia</td>
<td>An exit/slipping of a bowel from the abdomen through the wall of the cavity into the scrotum[^51,56]. It may either be direct or indirect hernias, which may or may not extend down to the scrotum.</td>
<td>Apparent, reducible scrotal swelling, Pain/discomfort while coughing, exercise, or bowel movements.</td>
<td>Magnetic resonance imaging (MRI)[^57], a diagnostic tool of high predictive value</td>
</tr>
<tr>
<td>Groin hernia</td>
<td>Herniation of small bowel through the external inguinal ring to scrotum.</td>
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<tr>
<td>Femoral hernia</td>
<td>Herniation of part of the abdominal contents, passing through weak area, the femoral ring at the posterior wall of the femoral canal. These swellings do not extend to the scrotum but rather are found below and lateral to the superficial inguinal ring</td>
<td>Worsens in the day comfortable while lying, severe pain on strangulation</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 7a & b:** Scrotal swellings: Axial T2 Weighted images showing mild fluid in left scrotal sac (white arrow- left testis, white arrowhead- right testis)

**Synopsis of differential diagnosis**

Scrotal swellings may either be of dermis, subcutaneous tissue or contents of scrotum, the utility of this diversification may prove beneficial, while preparing the instant day to day clinical dissertation. Besides, the afore mentioned conditions sarcoidosis[^59] presenting as hydrocele (*vide supra*) and juvenile dermatomyositis (JDM)[^59] characterised by edema of the penis and scrotum should also be considered.

**Multiple choice questions (MCQs)**

1. Which of these aspects of the clinical history would alert you to a possible diagnosis of hereditary angioedema in a patient with angioedema?
   a. Early onset of angioedema before early adulthood
   b. Angioedema but no wheals
   c. Family history
   d. No history of laryngeal oedema
   e. Prodromal symptoms
   i. a, b and c
   ii. a, b, c and e
   iii. a, b, d and e
   iv. a and d
   v. a, b, c and d
   Answer: ii

1. Which of the following is not a factor in the development of urticaria?
   a. Activation of sensory nerves
   b. Vasodilatation
   c. Extravasation
   d. Recruitment of pro-inflammatory cells
   Answer: c

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e. Separation of epithelial cells

Answer: e

2. For lichen simplex chronicus what is the single most important treatment?
   a. Topical corticosteroids
   b. Oral corticosteroids
   c. The patient must bathe regularly
   d. The patient must stop scratching

Answer: a

3. The epididymis is a _____ and it functions to _____.
   a. compartment inside a testis; secrete testosterone and form sperm
   b. stage of spermatogenesis; form two sperm cells and semen
   c. tightly coiled tube on the outside of the testis; store immature sperm as they mature
   d. compartment that contains seminiferous tubules; ejaculate sperm and semen out of the penis

Answer: c

4. Although epididymitis is uncommon in children, the most common cause of epididymitis is the
   a. H. influenzae
   b. Coliforms
   c. Staph. Aureus
   d. C. trachomatis

Answer: d

5. Choose the correct statement: - Hydrocele of the canal of Nuck
   a. Is mostly observed in males.
   b. Is usually found affecting females.
   c. Is formed due to fluid collection in the femoral canal.
   d. Is seen in children as well as adults.
   e. Is a painful, translucent and reducible swelling.

Answer: b

6. Which of the following are not usually observed in epididymo-orchitis:
   a. The epididymal tail is often more swollen than the head.
   b. In the majority of case there is some oedema and swelling of the testis.
   c. In the majority of cases there is a large hydrocele containing debris.
   d. In some cases there is swelling of the spermatic cord.
   e. The mumps virus causes orchitis without epididymitis.

Answer: c & d

7. In torsion of the testicular appendix, which of the following is incorrect?
   a. The condition causes only mild pain.
   b. The testis is relatively hypo-vascular on Doppler Study.
   c. There is often swelling of the spermatic cord.
   d. The condition does not occur in adults.

Answer: a

8. Varicocele is more common in left testis because:
   a. Left testicular vein drains into IVC which has high pressure
   b. Left testicular vein drains into left renal vein and has poor valve mechanism
   c. Left testis is lower situated
   d. Compression of testicular vein by rectum

Answer: b

9. Which of the following statements about the causes of inguinal hernia is correct?
   a. Excessive hydroxyproline has been demonstrated in the aponeuroses of herniapatients.
   b. Obliteration of the processus vaginalis is a contributing factor for the development of an indirect inguinal hernia.
   c. Physical activity and athletics have been shown to have a protective effect toward the development of inguinal hernias.
   d. Elevated levels of circulating serum elastase activity have been demonstrated in patients with direct herniation who smoke.

Answer: d

References

Scrotal Swellings