Scrotal sonography in infancy and childhood

M. Mearadji
International Foundation for Pediatric Imaging Aid
Rotterdam, the Netherlands
Introduction

- This presentation is limited only to acute and nonacute acquired scrotal pathology.

- This report is based on our own experiences, reviewed literature and retrospective study of 80 cases including acute and nonacute conditions.
Scrotal anatomy

- Scrotal wall
- Testis
- Epididymis (head, body and tail)
- Tunica vaginalis
- Spermatic cord (arteries, plexus pampiniformis, vas deferens)
Sonography is the first modality of choice in imaging of testicular pathology

- Non-invasive character
- Advancement in technology
Techniques

- High frequency linear array transducer 7 – 12 MHz
- Use of abundant warm coupling gel
- Scanning of scrotum and its contents in both transversal and longitudinal plains
- Measurement of volume and echogenicity of both testis
- Full color Doppler imaging programs including measurement of velocity of both hemiscrotum
Normal testicular volume in different pediatric ages

<table>
<thead>
<tr>
<th>AGE</th>
<th>cm³</th>
<th>SD</th>
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<tbody>
<tr>
<td>0 – 6 months</td>
<td>1,1 – 1,5</td>
<td>0,1</td>
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<tr>
<td>6 months – 10 years</td>
<td>0,7 – 1,1</td>
<td>0,5</td>
</tr>
<tr>
<td>11</td>
<td>1,1</td>
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<td>13</td>
<td>4,1</td>
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<td>16</td>
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<td>17</td>
<td>13,2</td>
<td>4,1</td>
</tr>
<tr>
<td>18</td>
<td>14,7</td>
<td>3,2</td>
</tr>
</tbody>
</table>
Normal sono-anatomy of testis
Acquired causes of small testis

- Cryptorchidism
- Torsion
- Inflammation
- Varicocele
- Post operative inguinal hernia repair
- Trauma

An example of atrophic left testicle following orchidopexia
Fluid collection

- Hydrocele is the most common cause of scrotal swelling in childhood (idiopathic).
- In neonates hydrocele is associated with a patent processus vaginalis.
- Acquired hydrocele:
  - testicular torsion
  - trauma
  - inflammatory process
- Hematocele:
  - Trauma
  - After abdominal surgery
- 6 cases with hydrocele and 3 cases with hematocele were reviewed
Fluid collection

6-month old boy with a double-sided hydrocele

Right-sided hematocele after bleeding post-pylorotomie

2 month old boy with a large hydrocele
Testicular tumors

- Solid testicular neoplasms are rare in childhood.
- The vast majority of testicular neoplasms derive from cells native to the testis, mostly Yolk Sac tumors.
- In 10-30% of the cases however neoplasms derive from testicular interstitium (Leydig or Serolli cells).
- Leukemia, lymphoma and metastases are rare secondary testicular neoplasms.
Testicular tumors

4-month-old boy with an immature teratoma

2-month old boy with a mature teratoma

Acute lymphatic testicular infiltration

Leydig cell tumor
Paratesticular tumors
Rhabdomyosarcoma

- Paratesticular rhabdomyosarcoma is the most common extratesticular tumor which tends to grow rapidly.
- They usually involve the epididymis or spermatic cord.
- The patients are younger than 5 years of age.
- Sonographic findings: well defined homogeneous or heterogeneous solid masses mostly hypoechoic.
- Our reviewed patient material includes 5 paratesticular rhabdomyosarcomas
Paratesticular tumors

4-year old boy with a paratesticular rhabdomyosarcoma
Paratesticular rhabdomyosarcoma in a 5-year-old boy
Epididymitis

- Acute epididymitis account for 28 to 47% of causes of acute scrotal pain.

- Peak age of presentation is 9 to 14 years.
- In younger boys causes can be secondary to genitourinary abnormalities.

- Sonographic findings: focally or diffusely enlarged epididymis, decreased or heterogeneous echogenicity scrotal wall thickening and associated hydrocele.

- Additional involvement of testis in ± 20% with increased size and decreased echogenicity.

- Color Doppler: increased blood flow
Epididymitis
Reviewed patient material

- 19 cases of acute epididymitis
- 1 case of chronic epididymitis
- Additional findings:
  - 8 cases with other genitourinary abnormalities
  - 12 cases with reactive hydroceles
  - 4 cases with scrotal edema
- Age: 1-15 years
- In all 20 cases the epididymis was enlarged with heterogeneous echogenicity.
- Color Doppler:
  - Increased blood flow in 14 patients
  - Not performed in 6 patients
Epididymitis

Epididymo-orchitis
Testicular torsion

- Three types:
  A. Intravaginal torsion only in the perinatal period.
  B. Extravaginal torsion after fixation of tunica albuginea to the scrotal wall.
  C. Occurs rarely below the epididymis of testis following twisting of the mesorchium.

- Clinical signs of torsion are acute scrotal pain, nausea and low grade fever.
- Boys after orchidopexie for repair of undescended testes have a 10 fold increased incidence of torsion.
Testicular torsion

- Sonographic findings:
  - enlargement and hypoechogenicity of testis and epididymis after 4-6 hours.
  - Reactive hydrocele

- Color and Power Doppler without testicular flow with sensitivity 90-100% and specificity of 100%.

- Our reviewed patient material includes 10 patients (4 neonates with extravaginal torsion, 6 with intravaginal torsion). All patients had an absent or decreased flow on color Doppler.
**Testicular torsion**

14-year-old boy with testicular torsion

Congenital testicular torsion
Varicocele

- Mostly seen in adolescent and adult (10-15%)
- Frequently idiopathic and left sided
- Rarely acquired (large abdominal mass)
- Associated frequently with atrophic testis and infertility.
- Multiple hypoechoic serpingious, tubular structure on sonogram (2-7 cm), increases in size during valsalva maneuver.
- Doppler flow: dramatic augmentation of flow within the dilated veins with the valsalva maneuver
Varicocele

13-year-old boy with varicocele and atrophy of the left testicle

In standing position after 3 min
Scrotal trauma

- **Causes:**
  - child abuse
  - motor accidents
  - athletic or straddle injuries

- Sonography is indicated to evaluate testicular hematoma, hematocele, fracture or rupture.

- Hematoma produces an enlarged testis with increased or decreased echogenicity.

- Testicular fracture is sonographically characterized by heterogeneous testis with curvilinear hypoechoic areas.

- Testicular rupture leads to extraction of testicular contents into scrotal sac.
Scrotal trauma

Scrotal trauma by a 15-year old boy

Posttraumatic testicular fracture

Traumatic changes of testis by delivery
Idiopathic scrotal edema

- Idiopathic scrotal wall edema is an acute condition with painful scrotal thickening.
- Occurs commonly in the age of 4-7 years.
- The pathogenesis is unknown and typically self limited.
- The testes and epididymis are not affected.
- Sonographically there is only the scrotal wall has thickened.
- It should be differentiated from lymphangiomatis of the scrotum with complex cystic structure.
Isolated swelling of scrotum

Idiopathic scrotal edema by a 5-year-old boy.

Cystic lymfangiomatosis in a 13-year-old boy.
Testicular calcifications
(microlithiasis)

- Microlithiasis is defined as multiple calcifications smaller than 2 mm.
- Incidence is 1 : 600 in boys.
- Can be associated with syndromes or with undescended testes.
- Development of testicular tumors is discussed, but is not confirmed.
- Our reviewed patient material consist of 3 patients. In all boys an orchidopexy was carried out in the past.
Microlithiasis of the testis in a boy with Prune Belly syndrome.
Orchidopexie occurred in the past.
Epididymal cysts and spermatoceles

- Spermatocele is a cystic dilatation of efferent tubules of the epididymis.
- Occurs only after puberty
- Located near the upper pole of the testis or in the head of the epididymis.
- Sonographically the cysts are hypoechoic
- Septation are occasionally observed
- Two cases reviewed
Epididymal cysts and spermatoceles

14-year old boy with a spermatocele

12-year old boy with an epididymic cyst and a large hydrocele
The most common causes of the acute scrotum in pediatric age are epididymitis and testicular torsion.

A reactive hydrocele is a frequent finding in both epididymitis as well as testicular torsion.

Color Doppler imaging is highly reliable to differentiate between testicular torsion and epididymitis both with nearly similar clinical signs.

There are 4 important sonographic signs of testicular torsion:
1. Heteroechogenicity
2. Absence of perfusion
3. Reactive hydrocele
4. Scrotal wall thickening

Paratesticular rhabdomyosarcoma are the most common non-germal neoplasms affecting the scrotal content.
Conclusion II

- Adequate equipment and sonoanatomic knowledge of the scrotum are needed in performing of scrotal sonography.

- A careful history and physical examination are imperative in work-up of a child presenting with an acute or nonacute scrotal pain or swelling.

- The relaxed environment of the sonography room should be used to obtain the detail of patient history.