CASE STUDY

Repeated missed diagnosis of testicular torsion

CASE SUMMARY

A 16-year-old male presented to the emergency room (ER) complaining of right-side lower abdominal pain with five episodes of vomiting, and a very short period of testicular discomfort (15 seconds), which had since improved. He was seen by a nurse practitioner. A CT of the abdomen was negative, and the physician observed no signs or symptoms of sepsis. Abdominal symptoms improved while in ER. The patient had an appointment with his primary care practitioner the next day, so he was discharged and told to return if symptoms returned.

Two days later, the patient was seen by urgent care for pain and swelling in the right testicle that had been present for two days, according to the patient. The patient also reported abdominal pain and vomiting two days earlier, with improvement in abdominal pain but increasing testicular and groin pain and a fever (100.2F). The physician noted right-sided scrotum redness, swelling, and tenderness. The urgent care provider discussed the importance of follow-up with the patient and prescribed an antibiotic (Ciprofloxacin) and supportive underwear for suspected orchitis (testicular inflammation).

Three days later, the patient presented to urgent care for follow-up and was seen by a different provider. The patient said the pain came and went but was worse in the morning. He reported no improvement with Ciprofloxacin. Pain was 5/10 and the exam showed right testicular erythema and tenderness with positive groin lymph nodes. The provider changed the prescription from Ciprofloxacin to Rocephin (another antibiotic with different spectrum of bacterial coverage), ordered a stat urology consult, testicular ultrasound (US), and follow-up appointment for re-check in three days if the patient could not be seen by a urologist. The urology referral was delayed until next day.

Two days later, ultrasound findings were consistent with right testicular torsion. The patient was taken to the operating room by the urologist for a right orchiectomy. The surgeon noted testicular torsion had likely existed for one week. Pathology confirmed extensive hemorrhage consistent with torsion.

ISSUES IDENTIFIED

1. Repeated presentations with failure to consider and urgently rule out torsion diagnosis

- First presentation: did not focus on testicular pain – diverted from testicular symptoms which were reportedly minor/short lived.
  - i. Ordering an abdominal CT, when normal, likely contributed to shutting down thinking more broadly.
  - ii. Need to recognize that the pain and symptoms can be intermittent with testicular torsion.
- Second presentation: Clear scrotal localization of problem, yet apparent failure to strongly consider or test to rule out torsion.
- Third presentation: Failure to improve/respond to antibiotic- main immediate treatment action was to change antibiotic.
  - i. The clinician did seriously consider alternative diagnosis because of the ordered urgent urology referral and ultrasound. But the 2-day appointment time-frame was an inappropriate delay.

2. Multiple locations of care and discontinuity of care: Problematic for a condition that is potentially a surgical emergency

- For this potential surgical emergency, the optimal situation for the patient was to be seen again in ER with onset of swelling or new concerning symptoms
  - i. Apparently, no continuity or emergency ultrasound was available in the urgent care clinic.
  - ii. Discontinuity of providers in urgent care, which is likely commonplace in this setting.
- A same-day surgical consult is the best course of action if testicular torsion is suspected
  - i. A patient with torsion should be on the operating table as quickly as possible, especially in cases of unilateral torsion or pain as testicular torsion is a urological emergency. After 12 hours, the chances of saving the testicle are reduced to 25%.

CHANGE IDEAS

- "Don't miss" diagnosis: Testicular torsion should be a "don't miss" diagnosis in young males due to its features of: a) rapid progression (from compromised blood supply progressing to complete infarction of testes), b) being readily correctable if diagnosed in a timely way and treated surgically, c) availability of a non-invasive screening test (US), which invites a low threshold for use, and d) potentially devastating consequences of failure to diagnose (infertility). Ensuring the timely ordering, availability, and performance of emergency ultrasound or emergency surgical consult is key.
- "Pull systems": protocols and processes are needed that rapidly streamline ultrasound and urology consultation for patients. Initial steps include proper analysis of the sources of delay and designing mechanisms to overcome the delay.
- Urgent care clinics: reassess the role of and practices at urgent care clinics and other first contact encounter venues to triage patients with such emergent problems as testicular torsion.
- Safety nets: more reliable follow-up and safety net practices are needed to proactively check on patient's improvement and coordinate urgent re-evaluation.
- Decision support: design effective decision support for potential "can't miss" diagnoses.
- Education: include this topic in parental education for perinatal-onset testicular torsion. For teenage-onset testicular torsion, include this topic in high school health education, pediatrician training, and parental and patient resources.
- Early risk detection: "bell clapper abnormality" (detected via an ultrasound), prior history of testicular pain, and testicular trauma pose risk for testicular torsion. Patients with these conditions need to be educated on the need for urgent presentation if experiencing symptoms.
- Ultrasound: false negative ultrasounds are likely when performed prematurely. While not a factor in this case, false negatives need to be considered when ordering and interpreting ultrasound results.
- Forcing function: cognitive safeguards are needed to guard clinicians against the bias introduced by a normal initial test (eg, CT abdomen) to mitigate false reassurance and help prevent premature closure of considering broader diagnostic possibilities.

TAXONOMIES

Diagnosis Error Evaluation and Research (DEER) Taxonomy

Where in the diagnostic process an error may have occurred

1. Access/Presentation	a. Failure/delay in presentation b. Failure/denied care access
2. History	a. Failure/delay in eliciting critical piece of history data b. Inaccurate/misinterpreted/overlooked critical piece of history data c. Failure in weighing critical piece of history data d. Failure/delay to follow-up critical piece of history data
3. Physical Exam	a. Failure/delay in eliciting critical physical exam finding b. Inaccurate/misinterpreted/overlooked critical physical exam finding c. Failure in weighing critical physical exam finding d. Failure/delay to follow-up critical physical exam finding
4. Tests (Lab/Radiology)	*Ordering (also called "pre-analytic phase")* a. Failure/delay in ordering needed test(s) b. Failure/delay in performing ordered test(s) c. Error in test sequencing d. Ordering of wrong test(s) e. Tests ordered to be done in the wrong way *Performance (also called "analytic phase")* f. Sample mix-up/mislabeled (e.g., wrong patient/test) g. Specimen delivery problem h. Technical errors/poor processing of specimen/test i. Erroneous lab/radiology reading of test j. Failed/delayed reporting of result to clinician *Clinician Processing (also called "post-analytic phase")* k. Failed/delayed follow-up of (abnormal) test result l. Error in clinician interpretation of test
5. Assessment	*Hypothesis Generation* a. Failure/delay in considering the diagnosis *Suboptimal weighing/prioritizing* b. Too little consideration/weight given to the diagnosis c. Too much weight on competing/coexisting diagnosis *Recognizing urgency/complications* d. Failure/delay to recognize/weigh urgency e. Failure/delay to recognize/weigh complications of a diagnosis
6. Referral/Consultation	a. Failure/delay in ordering referral/consult b. Failure/delay in obtaining/scheduling ordered referral c. Error/suboptimal quality in diagnostic consultation performance d. Failed/delayed communication/follow-up of consultation
7. Follow-up	a. Failure/delay in timely follow-up/rechecking of patient b. Failure to refer patient to close/safe setting/monitoring c. Failure/delay in needed monitoring or lab (BP, INR, repeat CXR) d. Failure/delay in communicating findings among healthcare providers

Reliable Diagnosis Challenges (RDC) Taxonomy

Factors that may have contributed to making diagnosis difficult

1. Challenging Disease Presentation	a. Rare diagnosis b. Atypical presentation c. Nonspecific signs and symptoms d. Unfamiliar/outside specialty e. Masking/mimicking diagnosis f. Red herring misleading finding (history, exam, lab/imaging) g. Rapidly progressive h. Slowly evolving i. Deceptively benign (or intermittent) course
2. Patient Factors	a. Language/communication b. Signal: noise (noisy pts with multiple nonspecific sx) c. Patient failure to share d. Patient failure to follow-up
3. Testing Challenges	a. Test availability, access, cost b. Logistical issues in obtaining, performing tests c. False positive/negative results d. Performance/interpretation challenges e. Equivocal results/reports f. Test follow-up issues
4. Stressors	a. Time constraints b. Discontinuities c. Fragmentation of care d. Memory reliance/challenges e. EMR challenges
5. Broader Challenges/ Failures	a. Recognition of acuity/urgency/severity b. Diagnosis of complication(s) c. Recognizing failure to respond to treatment d. Diagnosis of underlying cause e. Recognizing misdiagnosis

Generic Diagnostic Pitfalls Categories

Clinical patterns/vulnerabilities leading to missed, delayed or wrong diagnosis

1. Diagnosis/ Assessment	a. Disease A misdiagnosed/confused with Disease B b. Misled by atypical presentation c. Rare diagnosis: failure to consider or know d. Chronic disease presumed to account for new symptoms (especially in medically complex patients) e. Counter-diagnosis cues overlooked (e.g., red flags, things that don't fit not recognized) f. Drug or environmental factor overlooked as cause of symptoms, or as cause of disease progression g. No specific diagnosis made
2. History/ Physical	a. Non-specific/vague symptom(s); hard-to-pinpoint diagnosis b. Intermittent symptoms- overlooked because findings (e.g., exam, lab, EKG) negative when seen c. Failure to appreciate risk factor (or those at risk) for a given disease d. Failure to appreciate limitations of the physical exam
3. Testing	a. Failure to appreciate limitations of a test result(s) b. Failure in follow-up of abnormal/critical result
4. Communication	a. Communication failure with patient, including language barriers b. Failure around communication and ordering of lab tests c. Communication failure between physicians (e.g., PCP-specialist, ED-PCP)
5. Follow-up	a. Failure to monitor, note, or respond to evolving/continuing/persistent symptoms b. Inadequate follow-up visits/referrals, especially in the presence of diagnostic uncertainty
6. Other	a. Urgency of the clinical situation was not appreciated b. Diagnostic findings were masked or misinterpreted due to an intervention or drug (e.g., empiric treatment with oral or topical steroids, PPI, antibiotics, pain medications) c. Problems with inappropriate or over-referral

Cognitive Errors Taxonomy

Selected cognitive biases contributing to diagnostic errors

1. Premature Closure: accepting a diagnosis before it has been fully verified
2. Anchoring: tendency to fixate on specific features of a presentation too early in the diagnostic process and subsequent failure to adjust
3. Confirmation Bias: tendency to look for confirming evidence to support one's hypothesis, rather than disconfirming evidence to refute it
4. Search Satisfying: tendency to call off a search once a piece of data is found, and not considering/searching for additional findings or diagnoses
5. Availability Bias: tendency to give too much weight to diagnosis that come more readily to mind (e.g. recent dramatic case).
6. Base-Rate Neglect: failing to adequately take into account the prevalence of a particular disease
7. Knowledge Deficit (on part of provider)
8. Demographic/Stereotype Bias: Biases from personal or cultural beliefs about women, minorities or other patient groups for whom prejudices may distort diagnostic assessment
9. Other (please specify)

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