Singapore Med J 2006; 47(1) : 89

CME Article

Clinics in diagnostic imaging (107)

Dundamadappa S K, Tsou I Y Y, Goh J S K

Fig. 1a Supine radiograph of the abdomen and pelvis.

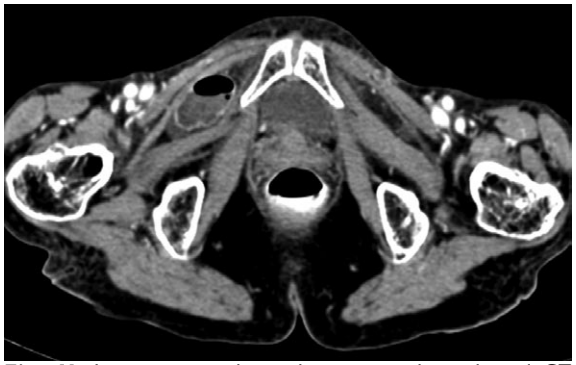

Fig. 1b Intravenous and rectal contrast-enhanced axial CT image of the lower pelvic cavity.

CASE PRESENTATION

A 90-year-old Chinese woman was admitted with severe abdominal pain of one day duration. For the past one month, the patient had mild intermittent colicky lower abdominal pain. Occasionally, the pain was located in the region of the right hip. On the morning of the day of admission, the pain had become severe and constant. She did not have any prior surgical history. On physical examination, the patient was tachycardic, normotensive and afebrile. The abdomen was soft. There was mild fullness and vague tenderness in the lower abdomen.

A clinical diagnosis of right ureteric colic was made and an abdominal radiograph obtained for evaluation (Fig. 1a). What does this show? Computed tomography (CT) of the abdomen and pelvis was subsequently performed on the same day (Fig. 1b). What is the diagnosis?

Department of Diagnostic Radiology
Tan Tock Seng Hospital
11 Jalan Tan Tock Seng
Singapore 308433

Dundamadappa S K, MBBS, MD
Medical Officer

Tsou I Y Y, MMed, FRCR, FAMS
Consultant

Goh J S K, MBBS, FRCR, FAMS
Consultant

Correspondence to:
Dr Ian Tsou Y Y
Tel: (65) 6357 8111
Fax: (65) 6357 8112
Email: ian_tsou@ttsh.com.sg

Fig. 1c Coronal reformatted CT image shows mild dilatation of the small bowel loops within the lower abdomen and pelvis, with the zone of transition from dilated to collapsed bowel loops at the level of the obturator hernia, and fluid-filled bowel within the hernia (arrow).

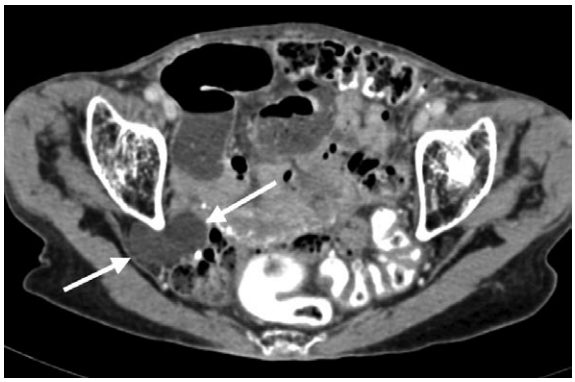

Fig. 1d Axial CT image of the greater sciatic foramina demonstrates a right sciatic hernia containing the right ovary. An ovarian cyst (between arrows) is seen arising from the herniated ovary.

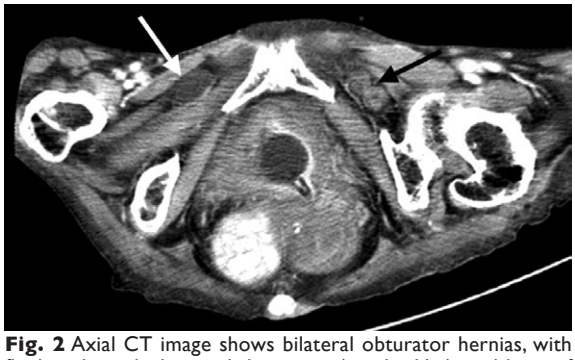

Fig. 2 Axial CT image shows bilateral obturator hernias, with fluid in the right hernia (white arrow) and a U-shaped loop of bowel in the left hernia, giving a double-barrelled appearance (black arrow).

IMAGE INTERPRETATION

The supine abdominal radiograph (Fig. 1a) showed mildly dilated small bowel loops in the lower abdomen. An air-filled bowel loop was projected over the region of right obturator foramen, below the level of the inguinal ligament. CT through the lower aspect of the pelvic cavity (Fig. 1b) showed a right obturator hernia, with the loop of bowel in the hernial sac having an air-fluid level within. The hernia was located between the adductor longus and pectineus muscles of the right hip anteriorly, and right obturator externus muscle posteriorly. The passage of the hernial sac with bowel within was also confirmed on the coronal reformatted CT image (Fig. 1c). On the same CT examination, herniation of the pelvic contents through the right sciatic foramen, with an ovarian cyst within, was also present (Fig. 1d).

DIAGNOSIS

Right obturator and sciatic hernias.

CLINICAL COURSE

Laparotomy was performed, and the finding of an obstructed right obturator hernia was confirmed. The hernia contained a loop of viable ileum about 20 cm from the ileocaecal junction. The hernial defect was 1.5 cm in diameter. The hernia was reduced easily, without need for bowel resection. Closure of the defect was done with sutures. The presence of the right sciatic hernia was also confirmed. Post-operative recovery was uneventful, and the patient was well when discharged four days after surgery. She remained asymptomatic at the one-month follow-up visit.

DISCUSSION

Anatomy

A hernia is defined as a pathological protrusion of the peritoneal cavity, and its appearance on different imaging modalities is similar, irrespective of the site of herniation. Imaging can be performed indirectly with demonstration of the contents of the hernia, or by direct visualisation of the hernial sac.

Obturator hernia

Groin hernias are by far the most common hernias within the body, and in this group, inguinal and femoral hernias are the most often encountered. An obturator hernia is the herniation of abdominal contents through the obturator foramen. It is a rare hernia with higher chance of obstruction and strangulation, compared to inguinal and femoral hernias. It accounts for 0.05% - 0.4% of all hernias and is responsible for 0.2%-1.6% of cases of mechanical intestinal obstruction. There is generally a 6% incidence of bilateral obturator hernias[1] (Fig. 2).

The obturator foramen is the largest foramen in the body, being formed by the rami of ischium and pubis. The obturator membranes, except anterosuperiorly where the obturator canals are located, cover the obturator foramina. The obturator canal is 2-3cm long and 1cm wide. The obturator nerve and associated blood vessels are located in this canal and are surrounded by fatty tissue.

Severe weight loss, ageing, and malnutrition contribute to a loss of the fatty tissue in the obturator canal, creating a space around the obturator nerve and vessels and predisposing to the development of an obturator hernia. Constipation, kyphoscoliosis, pregnancy are risk factors as they increase intraabdominal pressure. Women are affected 6-9 times more often than men, because of their broader pelvis and larger obturator canal. Pregnancy-induced relaxation of pelvic peritoneum also plays a part[2]. It is more frequent on the right side of the pelvic cavity, as the sigmoid colon tends to prevent it on the left.

There are three stages in the development of this hernia, namely:

- First stage – entrance of preperitoneal tissue into the pelvic orifice of the obturator canal.
- Second stage – development of a dimple in the peritoneum overlying the canal.
- Third stage – onset of symptoms produced by entrance of an organ into the canal.

Even though the first stage is a pre-hernial condition, it is unlikely that fat plugs are a high-risk[3]. But development of peritoneal dimples may be a marker of potential hernia formation.

The hernial contents are usually the terminal ileum but can include the large bowel, omentum, fallopian tube, or appendix. A significant proportion of patients present with intestinal obstruction. One-third of these patients have a history of previous attacks of small bowel obstruction. The symptoms of obstruction may subside initially, because transient herniation can resolve spontaneously[4].

The hernial sac causes pressure on the obturator nerve, resulting in hip pain radiating down the medial aspect the thigh to the knee (Howship-Romberg sign). This pain may be provoked or worsened by coughing or by extension, abduction or internal rotation of the hip. This sign is present only in 12.5% - 30% cases. As physical findings of obturator hernia are relatively non-specific, pre-operative diagnosis is often delayed and is made correctly in only 10-30% of cases[5].

Sciatic hernia

Sciatic hernia is one of the more uncommon forms of abdominal hernia. These hernias pass through the greater or lesser sciatic foramen. Owing to the great variety of symptoms that depend on the hernial content, this uncommon disease is difficult to diagnose clinically. These hernias most commonly involve the small bowel or distal ureter.

Sciatic hernia of the small bowel may lead to intestinal obstruction and present accordingly. The incidence of strangulation and bowel gangrene is high, even if duration of symptoms prior to patient presentation is short[6]. Hernia of the ureter or bladder may present with urinary symptoms. Sciatic hernias having the ovary and/or fallopian tube as their content are reported to be associated with chronic pelvic pain[7]. On rare occasions, sciatic hernias may mimic sciatica owing to compression of the sciatic nerve. Other contents like colon, omentum and Meckel diverticulum have also been described[8].

Imaging

The diagnosis of abdominal hernias is usually made by physical examination. However, clinical diagnosis can be difficult, especially in patients with obesity, pain or abdominal wall scarring[9]. On occasion, clinical history and findings may not be adequate for management decisions[10]. Physical examination has a sensitivity of 74.5% and specificity of 96.3% when compared to cross-sectional imaging studies, with laparoscopy as the gold standard[11]. Also, with advances in hernia repair, such as minimally-invasive laparoscopic surgery, the need to definitely identify the pathology as well as the type of hernia has become more important[12].

Early imaging examinations were only able to demonstrate the presence of a groin hernia by showing the contents of the hernial sac, or by indirect signs of mechanical intestinal obstruction (Figs. 3a & b). An air-filled bowel loop may be identified in the region of the obturator foramen, as was seen in our patient. A small bowel follow-through study or barium enema may show an opacified bowel loop, which may or may not be reducible[13] (Figs. 4a & b). This may not be an easy and rewarding procedure to do in cases of intestinal obstruction, as the flow of barium is likely to be slow due to the obstruction, hence prolonging the examination.

Herniography was the first imaging modality used to directly demonstrate the hernial sac, and is a useful adjunct in non-strangulating hernias. Herniography was first performed with air as a

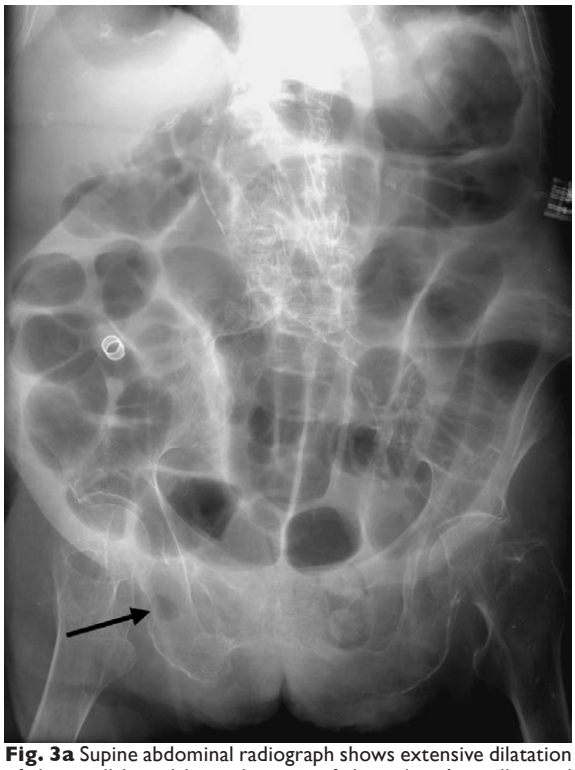

Fig. 3a Supine abdominal radiograph shows extensive dilatation of the small bowel loops but not of the colon. A small round lucency projected over the right obturator foramen is noted (arrow).

Fig. 3b Axial CT images confirms the presence of an incarcerated loop of air-filled small bowel within a right obturator hernia as the cause of the intestinal obstruction (white arrow). An incidental left obturator hernia with fluid in the hernial sac is present as well (black arrow).

negative contrast medium, and later with a positive contrast agent[14,15]. In this diagnostic procedure, a positive contrast agent is injected into the peritoneal cavity (peritoneography). Under local anaesthesia, a needle is placed in the peritoneal cavity, followed by injection of non-ionic contrast under fluoroscopy. The patient is tuned prone to ensure flow of contrast across the surface of the peritoneal cavity. The patient is then imaged with real-time fluoroscopy in the erect and prone positions, and asked to "strain down" and cough. Visualisation of the contrast agent in the expected positions of hernial outpouchings confirms the diagnosis.

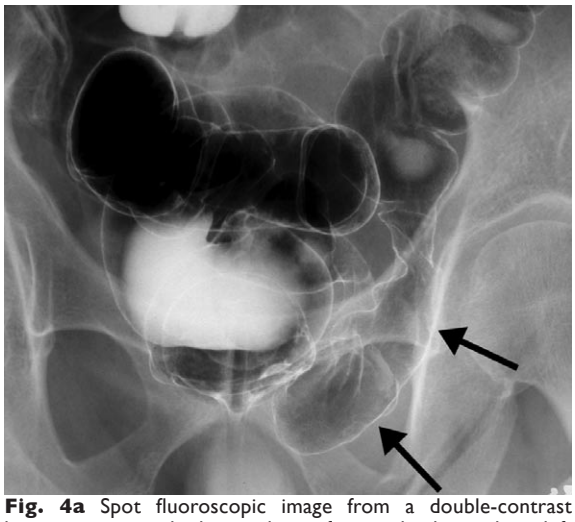

Fig. 4a Spot fluoroscopic image from a double-contrast barium enema study shows a loop of sigmoid colon within a left inguinal hernia (black arrows), without causing obstruction.

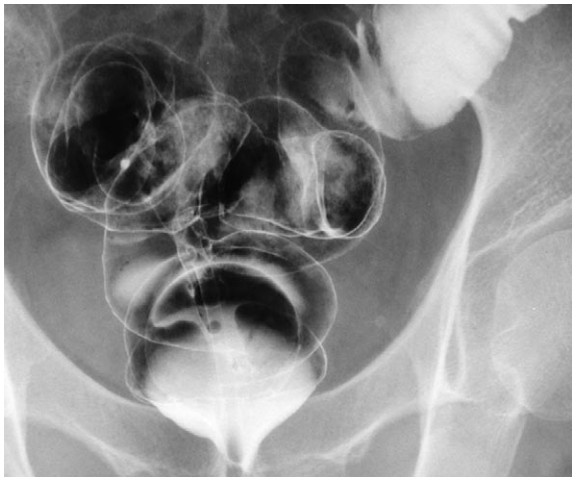

Fig. 4b Spot fluoroscopic image from the same study after manual pressure at the left groin region shows complete reduction of the hernia.

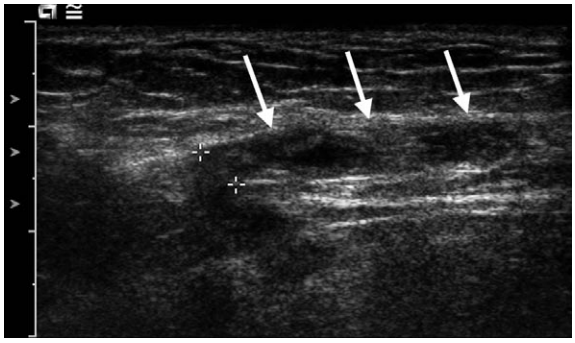

Fig. 5 US image of the right groin shows fluid within an indirect inguinal hernia (arrows), with the neck of the hernia identified at the superficial inguinal ring (between crosses).

Herniography is sensitive in diagnosis of abdominal wall herniations and still a reliable modality, although its lack of demonstation of adjacent soft tissue structures and invasiveness has reduced its use nowadays[16]. Potential complications

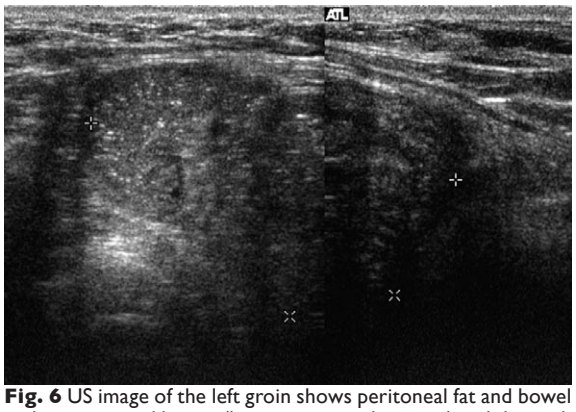

Fig. 6 US image of the left groin shows peritoneal fat and bowel within an inguinal hernia (between vertical crosses) and the neck of the hernia (between diagonal crosses).

Fig. 7a Axial CT image of the upper abdomen (delayed phase) showing right hydronephrosis and hydroureter, with contrast filling the dilated right pelvicalyceal system and ureter (arrows).

include bowel perforation, rectus muscle or retroperitoneal haematomas[17,18]. It may also not be easy to differentiate a direct from an indirect inguinal hernia.

Ultrasonography (US) of the inguinal region and inner aspect of the thigh for the diagnosis of hernia was first reported in 1975[19]. It has been noted as a reliable examination, with the commonest appearance being a hypoechoic tubular structure representing the hernial sac (Fig. 5). If there are oedematous and fluid-filled segments of intestine within the hernial sac, these are seen as an echogenic mass (Fig. 6). The major advantages of US are that it is non-invasive, allows for comparison with the asymptomatic side, and is able to be performed in physiological positions with dynamic scanning[20,21]. Operator dependency and the relatively long learning curve are limiting factors. Too much pressure on the transducer can also reduce the sensitivity of detection of hernias. Direct and indirect inguinal hernias can be distinguished by the position of the hernia relative to the inferior epigastric vessels, which can be identified on US[22]. However, obturator hernias are not as easily identified due to their deep location within the pelvic musculature and smaller hernial sac.

Magnetic resonance imaging when first reported in the evaluation of hernias, utilised standard non-dynamic sequences, which limited its usefulness[23]. Newer developments with faster sequences allow for dynamic imaging with straining[24]. CT is able to accurately diagnose obturator hernias, which can be hard to diagnose clinically[25]. With CT, the contents of the hernia can easily be identified (Figs. 7a-c). The hernial sac and its contents can lie between the pectineus and obturator externus muscles, or the superior and middle fascicles of obturator externus muscles, or the obturator internus and externus muscles.

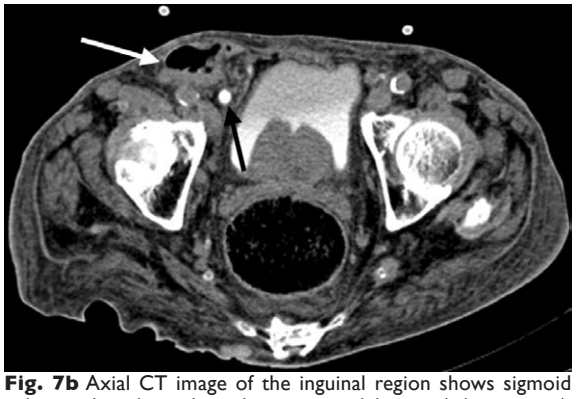

Fig. 7b Axial CT image of the inguinal region shows sigmoid colon within the right indirect inguinal hernia (white arrow), and the enhancement of the dilated right ureter (black arrow).

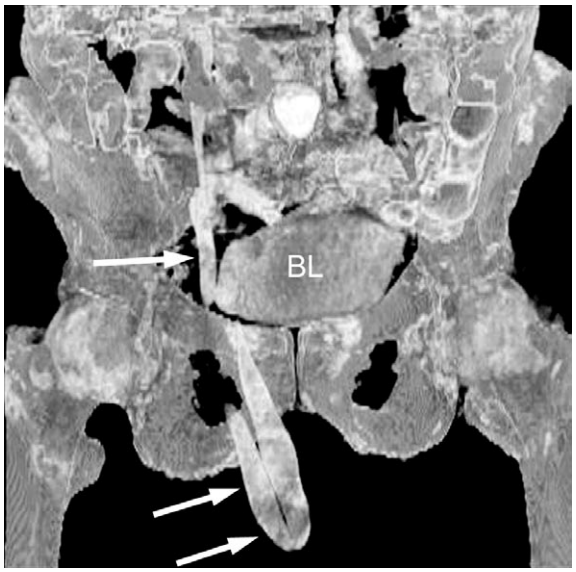

Fig. 7c Oblique coronal volume-rendered 3-D reconstructed CT image shows the dilated right ureter (arrows) forming a U-shaped loop within the hernial sac before entering the urinary bladder (BL).

Some of the advantages of CT include: more accurate identification of abdominal wall hernias and their contents, differentiation of hernias from other abdominal masses (tumours, haematomas,

abscesses, undescended testes and aneurysms), and detection of complications (incarceration, bowel obstruction, volvulus and strangulation)[26]. Spiral CT, and now multi-slice CT (MSCT), with its thinner slice sections and multiplanar capabilities can precisely delineate hernia type, location, size, and shape[27]. In addition, because of its superior anatomical detail, MSCT may potentially detect subtle signs of strangulation, such as mesenteric stranding, poor bowel wall enhancement, wall thickening, free air, or fluid in the hernial sac[28]. Postural manoeuvres, such as prone or decubitus positioning, and scanning while the patient performs the Valsalva manoeuvre may help depict subtle hernias as well.

In summary, the history and clinical examination still play the major role in diagnosis of abdominal herniations in the region of the groin. However, imaging is a useful adjunct in patients with history indicative of a hernia but with equivocal physical findings. In particular, CT is accurate in detection of obturator hernias that lie deeper in the patient as compared to the more superficial inguinal hernias. The latter are more commonly evaluated using US.

ABSTRACT

A 90-year-old woman was admitted for progressively increasing lower abdominal pain. There was no history of prior surgery, and physical examination was non-specific. The supine abdominal radiograph revealed an abnormal collection of air over the right obturator foramen. Computed tomography showed a right obturator hernia with incarcerated bowel in the hernial sac, and a right sciatic hernia containing the right ovary. The anatomy of obturator and inguinal hernias is reviewed, and the use of various imaging modalities in evaluation of abdominal hernias is discussed.

KEYWORDS: abdominal hernia, computed tomography, obturator hernia, sciatic hernia

Singapore Med J 2006; 47(1):89-95

REFERENCES

1. Rogers FA. Strangulated obturator hernia. Surgery 1960; 48:394-403.
2. Guillem P, Bounoua F, Duval G. A case of hip pain in an elderly woman. Br J Radiol 2000; 73:1233-4.
3. Callaghan CJ, Whitaker RH. Obturator canal fat plug: a pre-hernial condition? Clin Anat 2002; 15:276-9.
4. Gray SW, Skandalakis JE, Soria RE, Rowe JS Jr. Strangulated obturator hernia. Surgery 1974; 75:20-7.
5. Bjork KJ, Mucha P Jr, Cahill DR. Obturator hernia. Surg Gynecol Obstet 1988; 167:217-22.
6. Servant CT. An unusual cause of sciatica. A case report. Spine 1998; 23:2134-6.
7. Miklos JR, O'Reilly MJ, Saye WB. Sciatic hernia as a cause of chronic pelvic pain in women. Obstet Gynecol 1998; 91:998-1001.
8. Yu PC, Ko SF, Lee TY, et al. Small bowel obstruction due to incarcerated sciatic hernia: ultrasound diagnosis. Br J Radiol 2002; 75:381-3.
9. Ghahremani GG, Jimenez MA, Rosenfeld M, Rochester D. CT diagnosis of occult incisional hernias. Am J Roentgenol 1987; 148:139-42.
10. Deitch ES, Soncrant MC. The value of ultrasound in the diagnosis of nonpalpable femoral hernias. Arch Surg 1981; 116:185-7.
11. Van den Berg JC, de Valois JC, Go PM, Rosenbusch G. Detection of groin hernia with physical examination, ultrasound and MRI compared with laparoscopic findings. Invest Radiol 1999; 34:739-43.
12. Cheah WK, So JB, Lomanto D. Endoscopic extraperitoneal inguinal hernia repair: a series of 182 repairs. Singapore Med J 2004; 45:267-70.
13. Glicklich M, Eliasoph J. Incarcerated obturator hernia: case diagnosed at barium enema fluoroscopy. Radiology 1989; 172:51-2.
14. Arner O, Fernstrom I. The value of pneumoperitoneum in the diagnosis of hernia in the inguinal region. Surgery 1970; 67:741-7.
15. Oh KS, Borst JP, White JJ, et al. Positive-contrast peritoneography and herniography. Radiology 1973; 108:647-54.
16. Jones RL, Wingate JP. Herniography in the investigation of groin pain in adults. Clin Radiol 1998; 53:805-8.
17. Butsch JL, Kuhn JP. Intramural haematoma of the small bowel: a possible lethal complication of herniography. Surgery 1978; 83:121-2.
18. Ekberg O. Complications after herniography in adults. Am J Roentgenol 1983; 140:491-5.
19. Spangen L. Ultrasound as a diagnostic aid in ventral abdominal hernia. J Clin Ultrasound 1975; 3:211-3.
20. Harrison LA, Keesling CA, Martin NL, et al. Abdominal wall hernias: review of herniography and correlation with cross-sectional imaging. Radiographics 1995; 15:315-32.
21. Orchard JW, Read JW, Neophytom J, Garlick D. Groin pain associated with ultrasound finding of inguinal canal posterior wall deficiency in Australian rules footballers. Br J Sports Med 1998; 32:134-9.
22. Korenkov M, Paul A, Troidl H. Colour duplex sonography: diagnostic tool in the differentiation of inguinal hernias. J Ultrasound Med 1999; 172:389-92.
23. Wechsler RJ, Kurtz AB, Needleman L, et al. Cross-sectional imaging of abdominal wall hernias. Am J Roentgenol 1989; 153: 517-21.
24. Van den Berg JC, de Valois JC, Go PM, Rosenbusch G. Groin hernia: Can dynamic magnetic resonance imaging be of help? Eur Radiol 1998; 8:270-3.
25. Cubillo E. Obturator hernia diagnosed by computed tomography. Am J Roentgenol 1983; 140:735-6.
26. Aguirre DA, Casola G, Sirlin C. Abdominal wall hernias: MDCT findings. Am J Roentgenol 2004; 183:681-90.
27. Hahn-Pedersen J, Lund L, Hojhus JH, Bojsen-Moller F. Evaluation of direct and indirect inguinal hernia by computed tomography. Br J Surg 1994; 81:569-72.
28. Ianora AA, Midiri M, Vinci R, Rotondo A, Angelelli G. Abdominal wall hernias: imaging with spiral CT. Eur Radiol 2000; 10:914-9.

SINGAPORE MEDICAL COUNCIL CATEGORY 3B CME PROGRAMME
Multiple Choice Questions (Code SMJ 200601B)

	True	False
Question 1: Regarding obturator hernia:		
(a) There is a higher chance of obstruction and bowel incarceration compared to femoral hernias.	❑	❑
(b) It is due to a defect in the obturator internus and externus muscles.	❑	❑
(c) It is associated with weight gain with increased fatty tissue in the pelvic cavity.	❑	❑
(d) It is associated with constipation due to increased intra-abdominal pressure.	❑	❑
Question 2: In the clinical presentation of obturator hernia:		
(a) There is a 6% incidence of bilateral obturator hernias.	❑	❑
(b) It occurs on the left side more frequently than the right.	❑	❑
(c) It may present with hip pain.	❑	❑
(d) The clinical diagnosis is usually obvious, and imaging is not required to confirm the diagnosis.	❑	❑
Question 3: With regard to sciatic hernia:		
(a) There is a low incidence of strangulation and bowel obstruction.	❑	❑
(b) It may occur through either the greater or lesser sciatic foramen.	❑	❑
(c) It may cause neurological symptoms due to sciatic nerve compression.	❑	❑
(d) The distal ureter may be found in the hernial sac.	❑	❑
Question 4: In the imaging of abdominal wall hernias:		
(a) Herniography was the first modality used which was able to demonstrate the hernial sac directly.	❑	❑
(b) Herniography is a non-invasive procedure, which can be safely and easily performed.	❑	❑
(c) Ultrasonography is useful as it allows dynamic examination and real-time imaging, with the patient in different positions.	❑	❑
(d) Obturator hernias may not be easily identified on ultrasonography due to their deep location in the pelvis.	❑	❑
Question 5: Regarding the use of computed tomography (CT) in hernia imaging:		
(a) The contents of the hernial sac can be easily identified.	❑	❑
(b) CT may be able to identify other causes of an abdominal mass or symptoms, if no hernia is detected.	❑	❑
(c) Multislice CT is able to demonstrate anatomy well due to the thinner slice sections and multiplanar capability.	❑	❑
(d) CT must always be performed in the supine position.	❑	❑

Doctor's particulars:

Name in full:_____

MCR number:_____ Specialty:_____

Email address:_____

Submission instructions:

A. Using this answer form

1. Photocopy this answer form.
2. Indicate your responses by marking the "True" or "False" box ☑
3. Fill in your professional particulars.
4. Post the answer form to the SMJ at 2 College Road, Singapore 169850.

B. Electronic submission

1. Log on at the SMJ website: URL <http://www.sma.org.sg/cme/smj> and select the appropriate set of questions.
2. Select your answers and provide your name, email address and MCR number. Click on "Submit answers" to submit.

Deadline for submission: (January 2006 SMJ 3B CME programme): 12 noon, 25 February 2006

Results:

1. Answers will be published in the SMJ March 2006 issue.
2. The MCR numbers of successful candidates will be posted online at http://www.sma.org.sg/cme/smj by 20 March 2006.
3. All online submissions will receive an automatic email acknowledgment.
4. Passing mark is 60%. No mark will be deducted for incorrect answers.
5. The SMJ editorial office will submit the list of successful candidates to the Singapore Medical Council.