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REVIEW ARTICLE

Torsion of the gallbladder: a systematic review

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Abstract

Background: Gallbladder torsion is a rare disease, predominantly affecting elderly women. It is an important differential in the acute surgical abdomen.

Methods: A total of 324 published case reports of torsion of the gallbladder were reviewed. Features in diagnostic imaging suggestive of torsion were reviewed and summarized.

Results: Gallbladder torsion is primarily a disease of elderly people; the median age at presentation is 77 years. It is more common amongst women, occurring at a female : male ratio of 4 : 1, although not in childhood, when it occurs at a male : female ratio of 2.5 : 1.

Conclusions: Improved imaging techniques within the last 20 years have enabled the preoperative diagnosis of one quarter of patients with gallbladder torsion. With prompt surgical intervention, the condition has an excellent prognosis.

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Introduction

Since its initial description in 1898,[1] over 500 cases of gallbladder torsion have been reported.[2] Torsion of the gallbladder is an important differential in the acute surgical abdomen, which may incur significant morbidity if it is not recognized. The frequency of this condition has been observed to increase with age and peaks in subjects aged 60–80 years.[3] Women are more frequently affected than men, although in children it is reported to be more common amongst boys than girls. Previous authors have cited an adult female : male ratio of 3 : 1 and a paediatric male : female ratio of 4 : 1.[4]

The exact aetiology of gallbladder torsion remains unknown, although certain anatomical variants are thought to predispose to torsion.[5] In the first of these, the gallbladder has its own mesentery; in the second, the cystic duct and artery have a mesentery, and the gallbladder is free within the peritoneal cavity. Given the age distribution of patients with gallbladder torsion, these congenital variants are thought to be exacerbated following liver atrophy and loss of visceral fat.[6]

Torsion can be classified as incomplete, in which rotation is ≤180 °, or complete, in which rotation is >180 °. Both clockwise and anticlockwise rotation have been described; it has been proposed that clockwise rotation occurs as a result of gastric and duodenal peristalsis, whereas anticlockwise rotation is secondary to colonic peristalsis.[7]

The objectives of this paper were to review the existing literature on torsion of the gallbladder, present an up-to-date summary of preoperative investigations in the condition, and compile epidemiological and pathophysiological details from published case reports to build on existing knowledge of torsion of the gallbladder and its treatment.

Materials and methods

A systematic review was performed according to PRISMA (*p*referred *r*eporting *i*tems for *s*ystematic reviews and *m*eta-*a*nalyses) guidelines.[8] A literature search was performed using the MEDLINE database, with 'gallbladder', 'torsion' and 'volvulus' as keywords. Articles including either of the keywords 'torsion' or 'volvulus' were combined and were cross-referenced with articles including the word 'gallbladder' to give a final list. Further case reports were then compiled from the references of the initial articles.

Articles and case reports published in English, French, German, Italian, Norwegian and Spanish were included in the review. The following information was collated from the case reports: patient age and sex; presence of stones; whether a preoperative diagnosis of gallbladder torsion was made; operation performed; direction of rotation; whether the torsion was complete or incomplete, and mortality.

Table 1 Summary of results

Total patients	324 (100)
Adult patients	268 (84)
Male	55 (21)
Female	212 (79)
Paediatric patients, *n* (%)	51 (16)
Male, *n* (%)	36 (71)
Female, *n* (%)	15 (29)
Age, years	
Mean	64
Median	77
Gallstones present, *n* (%)	86 (32)
Direction of torsion, *n* (%)	
Clockwise	106 (33)
Anticlockwise	92 (28)
Unknown	126 (39)
Complete torsion, *n* (%)	205 (82)
Mortality[a], *n* (%)	7 (6)

[a]Cases published since 1991.

Data on preoperative diagnosis, operation performed and mortality were analysed for patients presenting between 1991 and 2011. All other data were analysed for all patients.

Results

The search returned a total of 372 articles. Of these, 145 were excluded because their content did not relate to gallbladder torsion (n = 45), they were in languages other than those that could be translated (n = 97), or because they dealt with animal subjects (n = 3). A number of further case reports (published prior to 1946) were compiled from the references of the earlier articles. Altogether, a total of 324 patients reported since 1898 were reviewed (Appendix S1). Results are summarized in Table 1.

The median age of the patients presenting was 77 years (range: 5 days to 100 years). The sample included 51 paediatric patients (aged 0–18 years, 16%) and 268 adult patients (aged > 18 years, 84%). The distribution of ages at presentation is shown in Fig. 1.

In all, there were 231 female and 92 male patients. In the adult group, 79% (n = 212) of patients were female. This contrasted with the paediatric group, in which 71% (n = 36) of patients were male.

Gallstones were present in the gallbladders of 86 (32%) patients. In the 198 patients in whom the direction of torsion was specified, clockwise torsion was apparent in 106 (53%) patients. Torsion was complete in 205 (63%) patients, incomplete in 45 (14%) patients, and unknown in the remaining 74 (23%) patients. The direction of torsion was clockwise in 81 (53%) patients with complete torsion and in 18 (60%) patients with incomplete torsion. There was no significant relationship between direction of torsion and whether it was complete or incomplete.

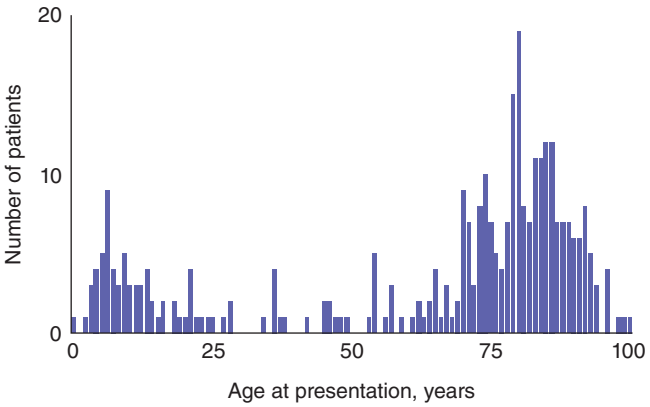

Figure 1 Age distribution of patients diagnosed with torsion of the gallbladder

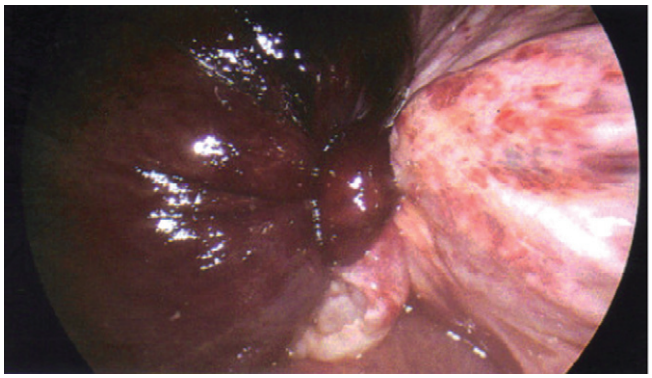

Figure 2 Laparoscopic view of a gangrenous gallbladder, with clockwise torsion of 360 ° on its mesentery

A preoperative diagnosis of gallbladder torsion was made in 32 of 125 (26%) patients reported within the last 20 years.

A total of 105 patients have been reported since the first successful laparoscopic cholecystectomy was performed for an acute case of gallbladder torsion in 1994.[9] Of these, 29 (28%) were treated laparoscopically and eight (8%) patients were converted from laparoscopic to open surgery (Fig. 2). One patient was reported to have undergone detorsion by endoscopic retrograde cholangiopancreatography (ERCP).[10]

Seven of the 113 patients presenting after 1991 in whom outcome was discussed died as inpatients, representing a mortality rate of 6%.

Discussion

The results of this study correlate with those of previous reviews.[11] Torsion of the gallbladder is primarily a disease that affects elderly subjects and occurs more commonly in females; in the adult population, the female : male ratio of occurrence was found to be 4 : 1 in the present study, which is even higher than the ratio of 3 : 1 cited in a previous report.[4] Amongst children, it is more

Figure 3 Computed tomography demonstrating a low-lying gallbladder with a diffusely thickened wall and pericholecystic fluid

frequent amongst boys, occurring at a male : female ratio of 2.5 : 1 (which is lower than that reported by Nakao *et al.*[11]).

Gallbladder torsion is a rare condition and has traditionally only been diagnosed intraoperatively. However, since 1991 one quarter of patients have been diagnosed preoperatively. This figure is likely to continue to rise with improvements in medical imaging techniques.

Findings of investigations of gallbladder torsion have been previously reported.[12–16] Ultrasound will often demonstrate a thickened gallbladder wall with pericholecystic fluid.[12] The gallbladder may appear to lie below its normal anatomic fossa and may have an echogenic conical structure (representing the twisted pedicle) at the gallbladder neck.[12] Stones may be an incidental finding (reported in 32% of the patients reviewed in the present study), but are not thought to play any role in the aetiology of the condition.[11]

Similarly, computed tomography (CT) scans may reveal an abnormal anatomical position of the gallbladder, as well as wall thickening and pericholecystic fluid (Fig. 3). Multidetector CT (MDCT) has been used successfully to diagnose gallbladder torsion preoperatively.[13,14] On pre-contrast scans, a V-shaped distortion of the extrahepatic ducts and a twisted pedicle inferior to the liver are findings suggestive of torsion; on post-contrast scans, poor enhancement of the gallbladder wall and twisting of the cystic artery with a 'whirl sign' can be observed.[14]

Gallbladder torsion has been reported to show as a 'bulls-eye' image on hydroxyiminodiacetic acid (HIDA) scans as a result of the accumulation of the radioisotope within the gallbladder.[15]

Magnetic resonance cholangiopancreatography (MRCP) has also been used in preoperative diagnosis of gallbladder torsion.[14,16] Findings in MRCP, as characterized by Usui *et al.*, show: a V-shaped distortion of the extrahepatic ducts; tapering interruption of the cystic duct; a distended and enlarged gallbladder deviated to the midline, and a difference in intensity between the gallbladder and the extrahepatic and cystic ducts.[16]

Torsion of the gallbladder has a mortality rate of 6%. The seven deaths reported in the last 20 years all occurred in elderly patients with multiple comorbidities. None of the reported deaths occurred in patients who were diagnosed with gallbladder torsion preoperatively; it is likely that early diagnosis and intervention can reduce the morbidity and mortality associated with this condition.

Conclusions

Torsion of the gallbladder is a rare disease, predominantly occurring in elderly women. Although it is an uncommon condition, improved imaging techniques combined with a high index of suspicion allow for accurate preoperative diagnosis. With prompt surgical intervention, the condition has an excellent prognosis.

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Conflicts of interest

None declared.

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Supporting information

Additional supporting information may be found in the online version of this article.

Appendix S1 Case reports of patients with torsion of the gallbladder referenced in this review.

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