TECHNICAL REPORT
RERF TR 14-83
業 績 報 告 書

ULTRASONOGRAPHY FOR BICAMERAL GALLBLADDERS REPORT OF THREE CASES

分裂胆嚢における超音波診断 3例の症例報告

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RADIATION EFFECTS RESEARCH FOUNDATION
財団法人 放射線影響研究所
A Cooperative Japan – United States Research Organization
日米共同研究機関

ACKNOWLEDGMENT
謝　辞

We are indebted to Barry B. Goldberg, M.D. and Hajime Nakata, M.D., D.M.Sc. for reviewing the manuscript and for their criticisms and suggestions. We are grateful to Haruo Ezaki, M.D., D.M.Sc. and Masaharu Takenaka, M.D. for lending us the radiographs and other materials, and to Mrs. Grace Masumoto for her assistance in preparing the manuscript. We greatly appreciate the help of the General Electric Co. and Yokogawa Medical Systems in providing us the GE Datason ultrasonographic apparatus which facilitated this study.

原稿を検討し，批判や助言をいただいた Barry B. Goldberg 博士及び中田 肇博士に謝意を表する．また，図を作成するためのレントゲン写真やその他の資料を提供していただいた江崎治夫博士，竹中正治博士及び原稿作成に助力をいただいた舛本幸江氏に感謝する．またこの研究を推進するに当たって GE Datason 超音波診断装置を提供された General Electric 社及び横河メディカルシステム社の御援助に対して深く感謝する．

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財団法人 放射線影響研究所

Research Project 研究課題 2-75

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SUMMARY

Three cases of bicameral gallbladder are reported, and in only one case could the fundal chamber be visualized by oral cholecystography. However, all structures were well visualized by ultrasonography. Ultrasonography is thus regarded essential for the diagnosis of bicameral gallbladders and for detecting any calculi within them.

INTRODUCTION

Bicameral gallbladder is an anomaly in which the organ's lumen is partitioned, often nearly completely, into two chambers. These chambers are usually of approximately equal size. Throughout this report the two chambers will be referred to as fundal and ductal, according to their proximity to the fundus of the gallbladder and the cystic duct. Oral cholecystography in such cases may visualize only the ductal chamber and part of the cystic duct; the fundal chamber and any calculi within it may go undetected. Using ultrasonography, however, both chambers and any calculi therein can be readily visualized.

Bicameral gallbladders were detected in three patients. In all three, the fundal chambers and the gallstones therein were not detected by oral cholecystography except when repeated for one case; the bicameral structure and gallstones were well demonstrated by ultrasonography.**

要 約

3例の分裂胆嚢を報告した．経口性胆嚢造影では1例しか底部室が描出されなかったが，超音波検査法(US)では3例とも分裂胆嚢本来の構造を描出することができた．分裂胆嚢であることの診断及び胆石の有無の診断には超音波検査法は不可欠な検査法である．

緒 言

分裂胆嚢は，胆嚢の内腔がしばしばほとんど完全に二室に分割される奇形である．各室は通常ほぼ同じ大きさである．本報ではこれらを，胆嚢底部に近いか胆管に近いかによって，底部室及び管部室と呼称する．このような症例に経口性胆嚢造影法を行っても管部室及び胆管の一部しか描出されず，底部室及びその中の結石は発見されない場合がある．しかし，超音波検査を用いれば，両室及びその中のいかなる結石も簡単に描出することができる．

3人の患者に分裂胆嚢が発見された．経口性胆嚢造影法では，繰り返し造影を行った場合に見られた1例を除いて，底部室及びその中の胆石は発見されなかったが，超音波検査**では3例すべてにおいて，分裂構造及び胆石がはっきりと描出された．

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***Real-Time Scanner, linear array 3.5 MHz transducer, U-Sonic RT-2000, Yokogawa Medical Systems Limited; Contact-Compound Scanner, 3.5 MHz transducer, General Electric Datason; Contact-Compound Scanner, 3.5 MHz transducer, Toshiba SAC-12A*

Approved 承認 3 August 1983

Printed 印刷 November 1984

CASE REPORT

Case 1, MF [redacted]

This 67-year-old man was diagnosed by ultrasonography as having a bicameral gallbladder with two calculi in the fundal chamber. Only the ductal chamber was visualized by intravenous cholecystography prior to cholecystectomy (Figure 1a). At surgery, the gallbladder was distended, and the cystic duct was ligated before removal of the gallbladder. The specimen was scanned, and two calculi were visualized in the fundal chamber (Figure 1b). Hypertrophied tissue containing minute cystic structures was seen between the chambers. On sectioning the specimen, two multifaceted calculi were found in the fundal chamber (Figure 1c). The hypertrophied tissue forming the septum contained a small opening allowing communication between the two chambers. This hypertrophied tissue contained numerous small cystic structures which were consistent with the ultrasonographic findings. The latter was confirmed histologically as due to adenomyomatosis (Figure 1d).

Case 2, MF [redacted]

This 52-year-old woman had microscopic hematuria and a 12 × 15 mm calcified density superimposed on the right kidney on abdominal radiography. Nephrolithiasis was suspected, but an intravenous pyelogram revealed a normal right kidney and a calcified density outside the projection of that kidney. Oral cholecystography (Figure 2a) revealed an ovoid gallbladder approximately 50 × 37 mm and a calcified density apparently outside the gallbladder. Ultrasonography (Figure 2b) visualized a bicameral gallbladder whose fundal chamber had a hypertrophied wall. A strong echo emanated from a calculus inside and was accompanied by a posterior shadow. The septum between the two chambers appeared to consist of hypertrophied tissue and was found to contain minute cystic structures.

Case 3, MF [redacted]

Abdominal radiography of this 69-year-old woman visualized an aggregate of approximately 20 calcified densities with irregular peripheries, each 2-3mm in diameter, to the right of the fourth lumbar vertebra. Oral cholecystography (Figure 3a) visualized a pear-shaped gallbladder with smooth walls, and a calcified density apparently outside the gallbladder. Subsequent ultrasonography (Figure 3b) revealed a bicameral

症例報告

症例１，MF [redacted]

67歳のこの男性は超音波検査により，分裂胆嚢で底部室に結石が２個見られると診断された．胆嚢切除以前の経静脈性胆嚢造影では管部室のみ描出された（図1a）．手術では胆嚢が緊満しており，胆嚢を切除する前に胆管を結紮した．標本を走査したところ，底部室に２個の結石が描出された（図1b）．微細な嚢胞性構造をもつ肥大した組織が室と室との間に見られた．標本を切開すると，底部室に角ばった結石が２個発見された（図1c）．中隔を形成しているこの肥大した組織には小さな開放部があり，それによって２室間がつながっていた．この肥大した組織は，多数の微細嚢胞性構造をもち，これは超音波検査所見と一致していた．後者は組織学的に，腺筋腫症によるものと確認された（図1d）．

症例２，MF [redacted]

この52歳の女性には，顕微鏡的血尿及び腹部レントゲン撮影で右腎に12×15mmの石灰化陰影が見られた．腎結石症が疑われたが，経静脈性腎盂造影像により，右腎は正常で，右腎の像の外側に石灰化陰影があることが判明した．経口性胆嚢造影（図2a）により，約50×37mmの卵円形の胆嚢，及び胆嚢の外側に明瞭な石灰化陰影が認められた．超音波検査（図2b）で，底部室壁が肥大した分裂胆嚢が描出された．胆嚢内の結石から強いエコーが起こり，それに伴って後方に陰影が生じた．２室間の中隔は肥大した組織から成っていると思われ，微細な嚢胞性構造をもつと判明した．

症例３，MF [redacted]

69歳の女性の腹部レントゲン撮影で，第４腰椎の右方に，周辺部が不規則で，それぞれ直径２～３mmの約20個の石灰化陰影が描出された．経口性胆嚢造影（図3a）により，壁面がなめらかで梨形をした胆嚢と石灰化陰影が明らかに胆嚢外に描出された．続いて行われた超音波検査（図3b）では，分裂胆嚢及び底部

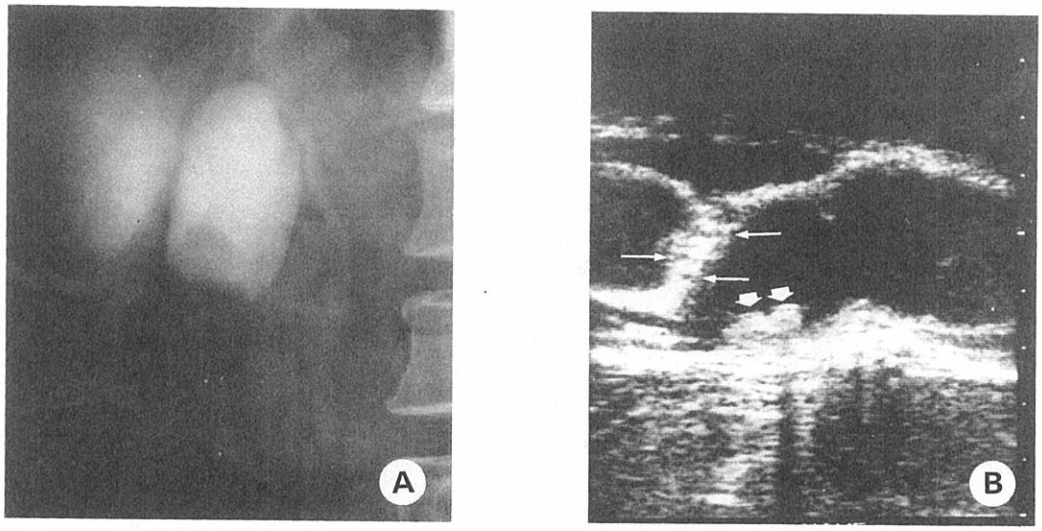

Figure 1 (MF[redacted]). A. Intravenous cholecystogram shows only the ductal chamber of the bicameral gallbladder and the bile duct. B. Water-bath scan of the resected gallbladder shows two calculi in the fundal chamber (arrowheads) and minute cystic structures in the hypertrophied tissue (arrows) between the chambers.

図1（MF[redacted]）．A．経静脈性胆嚢造影では分裂胆嚢の管部室及び胆管しか描出されない．B．切除した胆嚢の水中走査により，底部室に2個の結石（矢印頭部）及び2室間の肥大した組織の微細嚢胞性構造（矢印）が観察される．

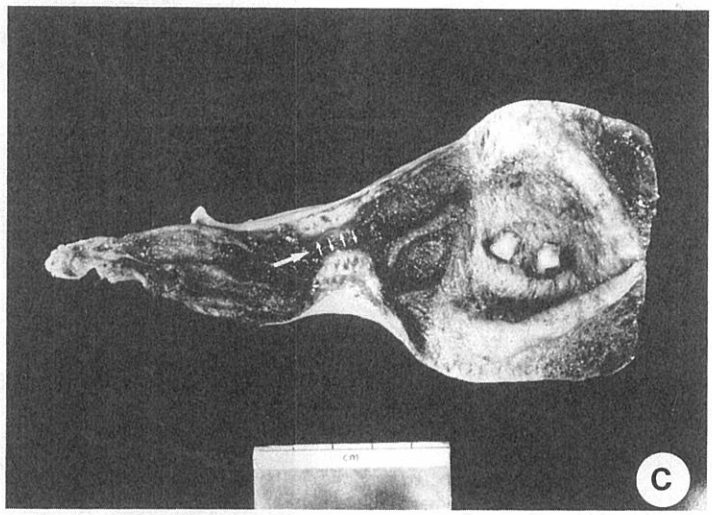

Figure 1 (MF[redacted]). C. Gross specimen reveals numerous cystic structures in the hypertrophied tissue (small arrows) which forms the septum between the two chambers of the bicameral gallbladder and through which there is communication via a small opening (arrow). The fundal chamber contains two multifaceted calculi.

図1（MF[redacted]）．C．肉眼標本から，分裂胆嚢の2室間の中隔を形成している肥大した組織（小矢印）中に嚢胞性構造が多数あることが分かる．2室はその中隔中の一つの小さな開放部（矢印）を通してつながっていた．底部室に角ばった結石が2個見られる．

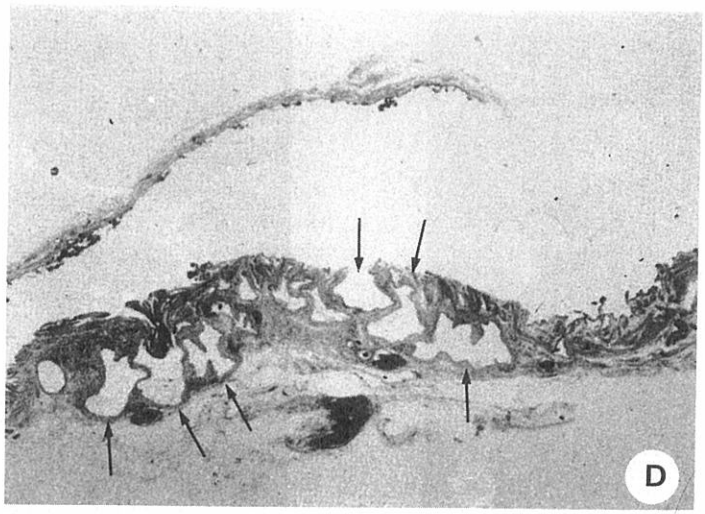

Figure 1 (MF[redacted]). D. Microscopic section reveals enlarged Rokitansky-Aschoff sinuses (arrows) in the hypertrophied tissue.

図1（MF[redacted]．D．顕鏡用切片では，肥大組織中に Rokitansky-Aschoff 洞拡張（矢印）が認められる．

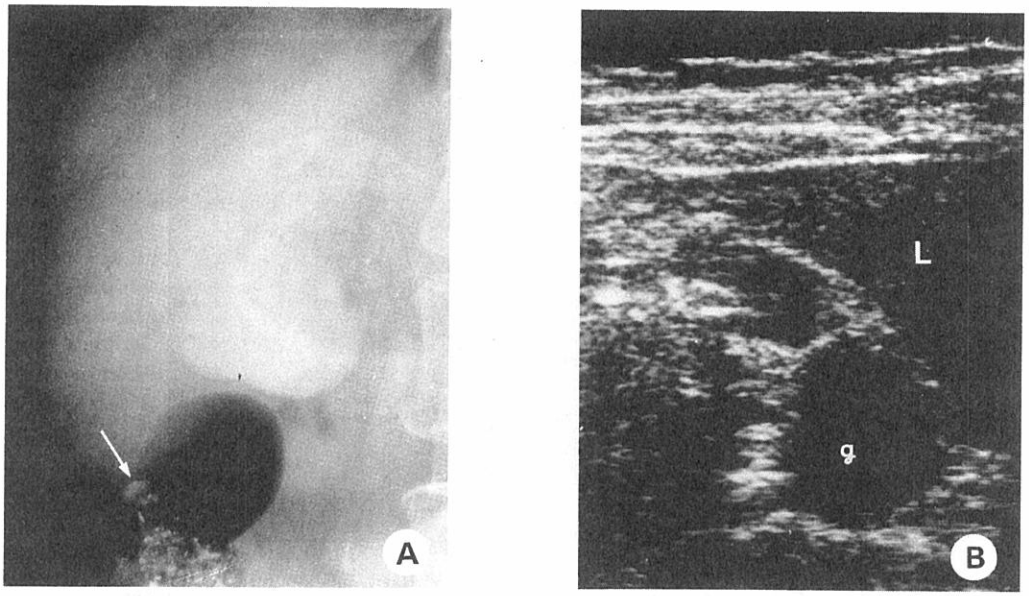

Figure 2 (MF[redacted]). A. Oral cholecystogram shows a calcification outside the projection of the gallbladder (arrow). B. Subcostal ultrasonography shows a bicameral gallbladder (g) and a calculus in its fundal chamber. L=liver.

図2（MF[redacted]）．A．経口性胆嚢造影で，胆嚢の像の外側に石灰化が観察される（矢印）．B．肋骨弓下走査の超音波検査で，分裂胆嚢（g）及びその底部室の結石が見える．L＝肝臓

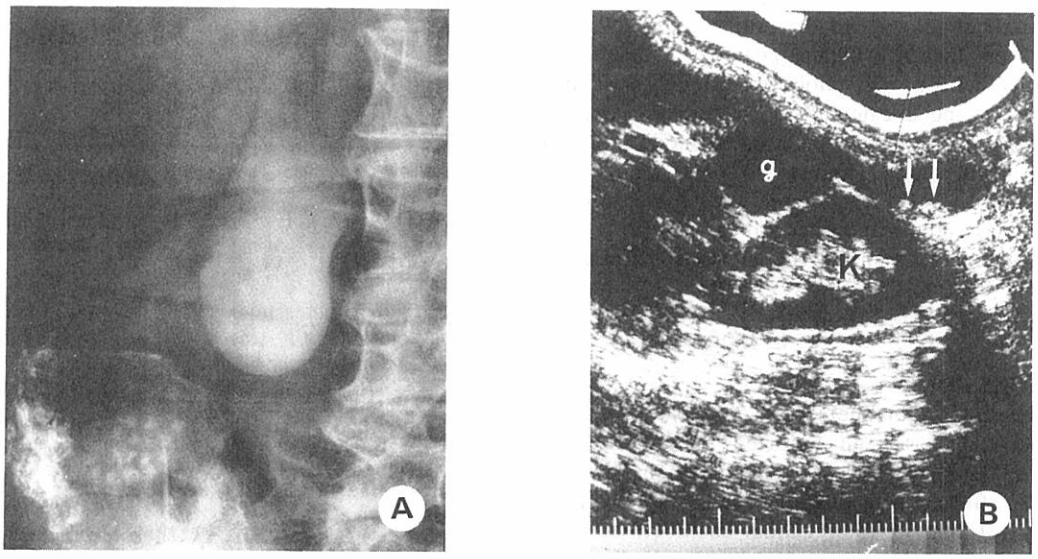

Figure 3 (MF[redacted]). A. Oral cholecystogram shows an aggregate of approximately 20 calcific densities, apparently outside the gallbladder. B. Sagittal ultrasonography shows a bicameral gallbladder (g) and calculi in its fundal chamber (arrows). K=right kidney.

図3（MF[redacted]）．A．経口性胆嚢造影で，胆嚢外に約20個の明瞭な石灰化陰影の集合が見られる．B．矢状方向超音波検査で，分裂胆嚢（g）及び底部室に結石が見られる（矢印）．K＝右腎

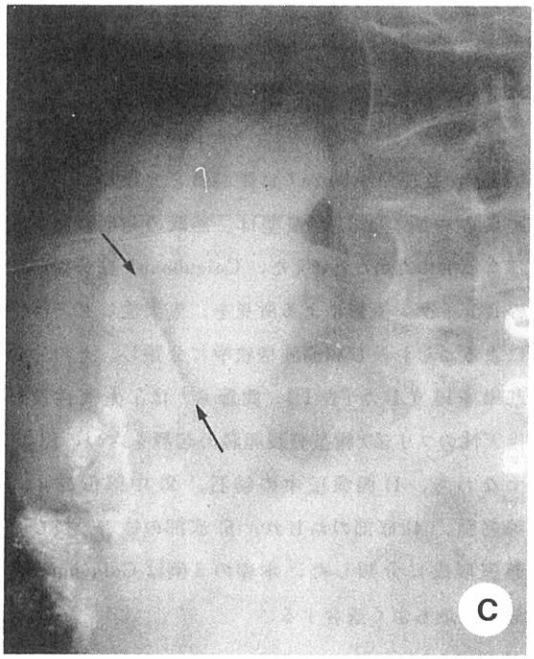

Figure 3 (MF[redacted]). C. Oral cholecystogram visualizes both chambers and the calculi in the fundal chamber. A smooth 2 mm separation represents the septum (arrows).

図3（MF[redacted]）．C．経口性胆嚢造影で両室と底部室の結石が描出される．平坦な2 mmの間隙は中隔である（矢印）．

gallbladder and a strong echo with posterior acoustic shadowing in the fundal chamber. The calcified density which appeared as outside the gallbladder on oral cholecystography was later found to be a calculus in its fundal chamber. The latter was devoid of contrast medium. Oral cholecystography (Figure 3c) one year later, visualized both chambers, the collection of calculi in the fundal chamber, and a 2 mm separation representing the septum between the chambers.

DISCUSSION

Bicameral gallbladders are not rare. Their prevalence has been reported by Boyden[1] as 7.5%, Nuboer[2] as 4%, and Lichtenstein[3] as 4.7%. Bicameral gallbladders reportedly contain stagnant bile in their fundal chambers and are frequently complicated by calculi and cholecystitis.[4-6]

When oral cholecystography is performed for bicameral gallbladders, the contrast medium tends to concentrate only in the ductal chamber. Cholelithiasis in the fundal chamber may be overlooked and the organ diagnosed as normal. Considering the fact that bicameral gallbladders have fundal chambers which may not be visualized during oral cholecystography, ultrasonography is essential not only for the diagnosis of bicameral gallbladders, but for the presence of calculi within them.

Ingegno and D'Albora[7] classified accessory gallbladders, and attributed septal and diverticular types of divided gallbladders to incomplete resolution of the solid stage of development of the gallbladder. Colquhoun[8] classified the radiographic appearances of divided gallbladders as congenital folds, kinks due to posture, and adenomyomatous strictures, and established criteria for their differentiation (Table 1). Muto et al[4] classified the origins of the congenital and acquired phrygian cap types of divided gallbladders into six categories: 1) calculi in a wall of a gallbladder, 2) septum formation, 3) adenomyoma, 4) kinking of a fundus, 5) adhesion of a fundus, and 6) diverticular formation. The three cases reported here fit Colquhoun's classification best.

The first case was proven histologically to be a bicameral gallbladder due to an adenomyomatous

室での強いエコーと，後方に音響陰影が確認された．経口性胆嚢造影法で胆嚢外にあると思われた石灰化陰影は，後に，底部室の結石だと分かったわけで，底部室には造影剤が流入していなかった．1年後の経口性胆嚢造影（図3c）では両室が描出され，底部室には一群となった結石が認められた．2 mmの間隙は室間の中隔を示している．

考　察

分裂胆嚢は稀ではない．その有病率はBoyden[1]によると7.5%，Nuboer[2]によると4%，そしてLichtenstein[3]によると4.7%と報告されている．報告によると，分裂胆嚢の底部室に胆汁の停滞が見られ，しばしば結石や胆嚢炎を合併しているという．[4-6]

分裂胆嚢の診断に経口性胆嚢造影を行うと，造影剤が管部室にのみ集合する傾向があり，底部室の胆嚢結石は見落とされ，正常と診断されることもあり得る．分裂胆嚢の底部室は経口性胆嚢造影では描出されない場合があることを考えれば，超音波検査は分裂胆嚢の診断のみならず胆嚢中の結石の発見にも不可欠である．

Ingegno及びD'Albora[7]は副胆嚢を分類して，分裂胆嚢の中隔型及び憩室型は，胆嚢の発生の実質期不全消失のためだと考えた．Colquhoun[8]は分裂胆嚢のレントゲン撮影による所見を，先天性ヒダ，体位によるねじれ及び腺筋腫様狭窄に分類し，その分類基準を確立した（表1）．武藤ら[4]は，先天性及び後天性のフリジア帽型分裂胆嚢の起源を六つの種類，すなわち，1) 胆嚢壁中の結石，2) 中隔形成，3) 腺筋腫，4) 底部のねじれ，5) 底部の癒着，及び6) 憩室形成に分類した．本報の3例はColquhounの分類に最もよく適合する．

最初の症例は組織学的に，腺筋腫様狭窄による分裂

TABLE 1 DIAGNOSTIC FEATURES OF SEPTATE GALLBLADDERS[8]

表 1　分裂胆嚢の診断的特徴[8]

	Congenital Fold (Phrygian Cap)	Kink due to Posture	Adenomyomatous Stricture
Position of septum	Usually situated near the fundus	Usually higher up in the body of the gallbladder	May be anywhere in the gallbladder
Thickness of septum	Up to 2 mm	About 2 mm	Usually considerably more than 2 mm
Extent of septum	Constant in any particular case. Usually more than 3/4 width of gallbladder	Varies with postural change. Usually less extensive than congenital septum	Constant. Usually more than 3/4 width of gall-bladder
Nature of surfaces	Surfaces smooth and parallel	Surfaces smooth and parallel for part of extent	Meniscus or triangular in cross-section. May be irregular
Junction between septal surfaces and gallbladder wall	Sharp, angular, constant	Smooth, curved. Change in different postures	Smooth, curved, constant
Situation of ostium connecting the loculi	Eccentric, adjacent to one wall	Eccentric, adjacent to one wall	Central or near central
Size of distal loculus	Usually small but diameter equal to that of proximal loculus immediately above	Usually large but diameter equal to that of proximal loculus	May be small or large, but diameter is usually less than that of proximal loculus
Opacification of loculi	Equal	Equal	Distal loculus often less owing to smaller diameter
Nature of contraction of distal loculus	Usually proportionate to size. Loculi remain close together after contraction	Usually proportionate to size. Loculi remain close together after contraction	Often excessive and may empty completely. Loculi are further separated after contraction
Rokitansky-Aschoff sinuses	Never seen	Never seen	Often seen around distal loculus or in or around the septum

stricture. The small cystic structures observed in the resected specimen were enlarged Rokitansky-Aschoff sinuses. These structures were also visualized in the septum ultrasonographically. The septum was approximately 14 mm thick, consistent with adenomyomatous strictures according to Colquhoun's classification. Rice et al[9] and Raghavendra et al[10] reported that the enlarged Rokitansky-Aschoff sinuses of adenomyomatosis appear as small cystic structures ultrasonographically, as in the present case.

Though the second patient did not undergo cholecystectomy, her septum was thick, and she had small cystic structures considered to be Rokitansky-Aschoff sinuses. This case is therefore presumed to be a bicameral gallbladder due to an adenomyomatous stricture.

In the third case, there was a thin septum between the two chambers, but no small cystic structures were visualized ultrasonographically. Contrast medium, which was not observed in the fundal chamber at the first examination, was present in it at the examination one year later, possibly due to an interval change in the communication between the chambers. On oral cholecystography, the septum appeared as a 2 mm belt-like separation between the chambers. This case can be classified as being due to a congenital fold or a kink due to posture.

The advantages of ultrasonography in visualizing gallstones have been frequently reported.[11-20] Ultrasonography has the capability of visualizing gallbladders which cannot be visualized by oral cholecystography in cases of liver function disorders, chronic cholecystitis, cholelithiasis, and other diseases. It can facilitate the diagnosis of gallstones in such circumstances.

The present study demonstrated that ultrasonography is especially useful in the diagnosis of cholelithiasis in bicameral gallbladders based on evidence obtained in three bicameral gallbladder cases with gallstones.

The experience with these three cases also suggests that to some extent the etiology of individual bicameral gallbladders can be determined ultrasonographically on the basis of features of the septa between their two chambers.

胆嚢と診断された．切除された標本に観察された微細嚢胞性構造は，Rokitansky-Aschoff 洞が拡張したものであった．これらの構造は中隔において超音波検査でも描出された．中隔は厚さ約14mmで，Colquhoun の分類による腺筋腫様狭窄と一致した．Rice ら[9] 及び Raghavendra ら[10] は腺筋腫症の Rokitansky-Aschoff 洞拡張は，本症例のように，超音波検査を用いると微細嚢胞性構造に見えると報告した．

第２の患者は胆嚢切除術を受けていないが，中隔は厚く，Rokitansky-Aschoff 洞と考えられる微細嚢胞性構造が見られた．この事から，この症例は腺筋腫様狭窄による分裂胆嚢と考えられる．

第３の症例では，２室間に薄い中隔があったが，超音波検査では微細嚢胞性構造は描出されなかった．第１回目の検査では底部室には造影剤が見られなかったが，１年後の検査では見られた．これはおそらく２室間のつながり方に何らかの経時的変化が生じたためであろう．経口性胆嚢造影では中隔は２室間の２mmのベルト状の仕切りのようであった．この症例は，先天性ヒダ又は体位によるねじれによるものと分類される．

胆石を描出する上での超音波検査の利点は，数多く報告されている．[11-20] 肝機能異常，慢性胆嚢炎及び胆石症などの際に，経口性胆嚢造影では描出できない胆嚢を，超音波検査により描出することができ，このような際の胆石の有無の診断は超音波検査法によって向上する．

本研究で，特に分裂胆嚢の胆石症の診断には超音波検査が有効であることが，胆石を伴う分裂胆嚢３例から得た証拠により証明された．

これらの３例についての観察から，分裂胆嚢の個々の原因は，２室間の中隔の特徴に基づいて，ある程度までは超音波検査で究明できることも示唆された．

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