

population containing normal TH1 like helper T cells which produce mainly IL-2 and not IL-4, and the low density population contain normal TH2 like helper T cells produced mainly IL-4 and not IL-2.

To investigate the age associated change of these helper T cell subpopulations, two-color fluorescence flow cytometry was performed by incubating lymphocytes from the Peyer's patch (PP), the spleen, and the peripheral lymph node (PLN) of SAMP1/Kgy and control SAMR1/Kgy mice with fluoresceinated anti-CD4 and 16A.

Lymphocytes from the Peyer's patch and the spleen of SAMP1 mice had decreased 16A-high density populations and increased 16A-low density populations in CD4 positive cells with age, but there was no change detected in lymphocytes of the peripheral lymph nodes.

Thus, these changes play a role affecting mucosal immunity of aging in SAMP1 mice.

1307 Quality of Cholecystectomy Before and After Introduction of Laparoscopic Technique

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To evaluate the quality of cholecystectomy and establish a standard for continuing surveillance, data on all cholecystectomies (laparoscopic as well as conventional open procedures) were collected prospectively during the first two years after introduction of the laparoscopic technique. For comparison, data on all cholecystectomies in the last five years before laparoscopy were collected retrospectively through analysis of the detailed case notes.

Parameters of quality included morbidity, 30-days mortality, reoperation rate and frequency of residual bile duct stones.

In the pre-laparoscopic period, 463 patients had open cholecystectomy. 174 of these had an acute operation. In the laparoscopic period (222 patients), 158 patients were selected for elective laparoscopic cholecystectomy, while 64 had a primarily open procedure. Thirty-seven of these had an acute operation. Thirteen patients (8.2%, 95% CI 4.4–13.5%) were converted from laparoscopic to open cholecystectomy.

The overall complication rate was reduced from 30% to 23% due to a reduction of general complications (17% vs. 10%, $P < 0.05$), mainly attributable to a reduction in the occurrence of pulmonary complications. The procedure related complication rate was 13% in both periods; septic complications dominating in the pre-laparoscopic period, while seven cases of bile leakage in the laparoscopic group, and six cases of incisional hernias or wound dehiscence in the primarily open procedures dominated in the laparoscopic period. Bile duct injury occurred in 3/463 (0.6%, 95% CI 0–1.4%) patients in the pre-laparoscopic period, and in 2/222 (0.9%, 95% CI 0–2.1%) in the laparoscopic period (NS). Both cases occurred in the laparoscopic group.

The mortality rate was 1.5% and 0.5%, respectively (NS). Reoperation was necessary in 2.8% and 2.3% (NS), while residual stones were later detected in 1.5% and 2.7% (NS).

In conclusion, both general and procedure-related complications should be further reduced. This may be accomplished if more patients are operated laparoscopically, thus avoiding complications such as wound complications. Bile leak may be avoided through meticulous technique and increasing experience.

1308 Central Wire Rupture in Mechanical Lithotripsy of Bile Duct Stones – A New Technique in the Management of this Complication

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Introduction: While the break of one branch of the lithotripter basket allows in general the removal of the defective basket the complete break of the central-wire leads to an impaction of the stone in the duct with non removable basket. Very often a surgical intervention is in those cases the only solution of the problem.

Patients: In a series of $n = 535$ patients with bile duct and pancreatic duct stones in $n = 58$ patients (10.8%, 2x pancreatic duct stones) a mechanical lithotripsy was necessary. We used the "Wurbs"-system (Pauldrach Inc. Hannover, FRG). In 3 of the 58 patients (5.2%, $n = 2$ bile duct stones and $n = 1$ pancreatic duct stone) the technical complication of the break of the central-wire at the winch due to the hardness of the stone occurred.

Results: We tried first by insertion of a second basket system a lithotripsy and by this an excorperation of the first basket that was not successful. We solved the problem in the two cases of bile duct stones by guiding the broken cable once more through 10 cm shortened versions of the outer helix (specially made) and fixing them in the winch. By graduation in four steps of the spiral helix lengths of 10 cm (70-60-50-40) there was a four-times repetition of the lithotripsy possible. A 15 x 12 mm big pancreatic duct stone was due to his hardness not successfully extractable. Only after further ap-

plication of extracorporeal shock waves the disaggregation of the stone and excorperation of the lithotripter basket was obtainable.

Conclusions: The system of the fourfold graduated length of the outer helices allows a new lithotripsy for three times in case of broken central wire. It should be available and present for every mechanical lithotripsy. With this device this severe technical complication is kept under control except the hardest stones without any surgical intervention. ESWL should be tried for hard stones in case of failed mechanical lithotripsy and stucked basket before a surgical intervention.

1309 Success of Mechanical Lithotripsy of Bile Duct Stones – Results in an Unselected Series of 515 Patients

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Introduction: In a series of 515 patients we examined the value of endoscopic stone removal from the bile duct system only by mechanical lithotripsy. In the literature at present there is 92% success rate by ESWL.

Methods: In patients with choledochal stones we aimed at a complete sphincterotomy. Independent of the size of the stone, number, consistency, localisation and anatomic situation (e.g. Billroth-II-situs or duodenal diverticulum) we primarily tried to extract the stones with the basket. When there was a potential disproportion between possible sphincterotomy size and stone size and if it is impossible to extract the stones the lithotripsy with the "Wurbs"-lithotripter was performed.

Results: In the time from 09/90 to 11/93 we found in 2614 endoscopic retrograde cholangiograms (= ERC) $n = 515$ patients with bile duct stones, $n = 103$ patients. With large juxtapapillary duodenal diverticula; $n = 304$ patients of them had singular duct stones and $n = 211$ multiple stones. At maximum we found in 1 pt. 25 stones. The diameter of the largest one was 4 cms. In $n = 459$ out of 515 patients (89.1%) a complete clearing of the bile duct system was possible with endoscopic sphincterotomy and stone extraction. In $n = 56$ out of 515 patients (10.9%) a lithotripsy was necessary. In $n = 41$ patients one session was sufficient. In $n = 15$ patients several procedures (in the mean 2.3 lithotripsy sessions) were required. Despite lithotripsy in $n = 5$ patients a stone elimination could not be completely performed. There were 3 patients who refused further endoscopic sessions and 2 patients with difficult anatomic situations (Billroth-II-situs, duodenal diverticulum).

Conclusions: In 51 out of 56 patients (91.1%) a mechanical lithotripsy was successful. In total we could reach a complete stone removal from the bile duct system by endoscopic therapy by mechanical lithotripsy in 510 out of 515 patients (99.0%) independent of stone size, consistency, localisation and the special anatomic situations by previous operations or diverticula.

1310 Extracorporeal Shock-Wave Lithotripsy of Gallbladder Stones – An Evaluation of Selection Criteria

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Diverging results have been reported regarding the outcome of extracorporeal shock-wave lithotripsy (ESWL) for symptomatic gallbladder stones. Some of these differences may be explained by variations in selection criteria. With the introduction of laparoscopic cholecystectomy it has become even more important to define appropriate inclusion criteria for ESWL. Furthermore, it has been shown that the cost-effectiveness of ESWL for large stone burdens can not compete with that of cholecystectomy.

Methods: Since 1989 we have treated 159 patients with ESWL (Dornier MPL900 lithotripter) and oral litholysis (ursodeoxycholic acid) for symptomatic calcified or non-calcified gallbladder stones occupying at most half of the gallbladder volume. In 14 patients further treatment is planned to achieve satisfactory stone fragmentation, which was defined as a maximum fragment size of 5 mm. The remaining 145 patients, which are analysed here, are either stone free, cholecystectomized, or have one or more remaining fragments of 5 mm or less.

Results: The overall cumulative gallbladder clearance rate was 11% at one month, 25% at six months, 40% at one year, 47% at two years, and 51% at three years. Corresponding figures for cholecystectomy were 1%, 7%, 16%, 32%, and 30%. Patients with a stone volume of ≤ 4.2 ml (corresponding to one spheric stone with diameter 2 cm) had significantly higher clearance rates than patients with a stone volume of > 4.2 ml (16% vs 6% at one month, 33% vs 13% at six months, 53% vs 28% at one year, 59% vs 42% at two years, and 69% vs 36% at three years). Clearance rates were also higher for one stone than for multiple stones, and better clearance rates were achieved with a good than a poor gallbladder filling at oral cholecystography. In this series, the occurrence of calcified stones did not influence clearance rates. The gain in clearance rates due to selection according to other factors than stone volume was marginal. Patients with a stone volume of ≤ 4.2 ml constituted 13% of all

patients treated with ESWL or surgery for symptomatic gallbladder stones.

Conclusion: According to these results and those of others, ESWL for gallbladder stones can only be recommended as a treatment of choice for the few selected patients who at ultrasonographically monitored provocation show a good gallbladder contractility (volume reduction $\geq 50\%$), have a stone volume of ≤ 4.2 ml and, preferably, only one stone.

1311 Extracorporeal Shock Wave Lithotripsy (ESWL) for Difficult Bile Duct Stones (BDS)

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Conventional endoscopic treatment of BDS (biliary sphincterotomy extraction by Dormia basket or Fogarty balloon) may fail in 5–10% of patients. We report our experience with the use of ESWL for treatment of endoscopically unretrievable BDS.

Patients From March 1992 to December 1993, 28 patients (14 M, 14 F; mean age 67, range 29–93 years) with unretrievable BDS (8 intrahepatic, 20 common BDS) were treated by ESWL. Five patients had a Billroth II gastrectomy. **Method** ESWL was performed using an electromagnetic lithotripter from Siemens (Erlangen, Germany) the Lithostar, utilizing for focusing a bidimensional x-ray system. A naso-biliary (n = 27) or a T-tube (n = 1) cholangiography was used to define stone position. Patients were sedated with intravenous injection of 5–10 mg. of morphine. The mean number of sessions for patient was 1.3 (1–3). A mean number of 4653 shock waves (2000–6500) per session and 6315 (2000–15000) per patient were administered. **Results** The procedures were well tolerated by all the patients. Mild cardiac arrhythmias were detected in 3 patients. No morbidity and mortality correlated to the procedure were observed. Stone fragmentation was achieved in 27/28 patients (96.5%). Complete clearance of BDS was achieved in 25/28 patients (89%) either by endoscopic extraction (20) or after mechanical lithotripsy (2). Spontaneous passage of fragments was observed only in 3 cases. The failures underwent biliary stenting (2 patients) or no treatment (1 patient). **Conclusions** ESWL is a safe and effective method to facilitate endoscopic extraction of difficult BDS and it may replace more invasive methods of treatment.

1312 Side Effects After ESWL – Ultrasonographic Findings

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During a period of 3 years (1989–1992) 243 patients who had calculus of the gallbladder were treated by ESWL applying Siemens Lithostar Plus. In some patients reinterventions have been done. The lithotripsy was followed by oral administration of litholytic therapy. The aim of our study was detection of side effects which could be verified by ultrasonography. In 57 (23%) patients anatomic changes of the gallbladder after ESWL were detected and in 18 (7.3%) patients two anatomic changes were found at the same time. Light thickening of the gallbladder wall was diagnosed in 13 (5.3%) patients without reinterventions, in 4 (1.6%) patients after first reintervention and in one (0.4%) patients after second reintervention. Extensive thickening of the gallbladder wall was found in 16 (6.6%) patients without reinterventions and in 4 (1.6%) patients after first reintervention. Contraction of the gallbladder wall was detected in 29 (11.9%) patients without reinterventions and in 6 (2.5%) after first reintervention. The signs of acute cholecystitis were detected in 2 (0.8%) patients without reinterventions. Altogether, 75 anatomic changes of the gallbladder wall after ESWL were detected, 60 changes (25%) were reversible, 15 changes (6%) were irreversible and 5 (2%) patients had to be treated surgically because of irreversible changes of the gallbladder and unsuccessful intervention. Reversible changes were normalized in the most of cases. All of this changes of the gallbladder after ESWL are mostly reversible and have no important role in normal function of the gallbladder. Two patients (0.8%) had signs of acute pancreatitis 7 days after ESWL. Both of patients were treated successfully. We can conclude that ESWL followed by litholytic therapy is a effective and safe therapy for a highly select population of the patients with cholelithiasis.

1313 Prophylactic Stenting (PS) in the Treatment of CBD-Stones

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Endoscopic papillotomy (EPT) is accepted as a standard procedure in patients with CBD-stones. In a small percentage of these patients it is not possible to extract the stones, and the patients are in danger of having new attacks with impacted stones and cholangitis.

Since the mid eighties we have inserted prophylactic pig-tail stents to overcome this risk.

In the five year period from 1988 to -92 we have done 850 ERCPs at the Central Hospital in Fredrikstad and of these 301 papillotomies because of CBD-stones. In this period we have inserted 25 stents because of problems with stone extraction which represent 8% of EPT group.

In approximately 40% of the patients stenting has become the final treatment of their condition because of high age and generally bad health. In another group representing 35% of the material there has been no new events until final clearing of their stones 2–12 months after insertion of the stents. In the same group we did see fragmentation of stones in some and spontaneously clearance in others.

2 of the 25 patients had new attacks of gallstones 5 and 10 months later and another 2 got cholangitis 1 and 8 months later.

2 of the patients underwent cholecystectomy because of cholecystitis 3 days and 8 months later, one of these also had a cholecystectomy. All of these 6 patients had stents in position.

We conclude that prophylactic stenting (PS) is a satisfactory treatment in patients with problematic CBD-stones. The procedure should be a temporary solution, but we think that it can be the final treatment in selected patients. In some patients there will be a fragmentation of the stone/stones and spontaneously clearance.

PS will not always prevent new attacks of stones or cholangitis/cholecystitis and we recommend close control and immediate ERCP if the patients get symptoms of impacted stone or infection. Prospective studies of PS is necessary to evaluate its place in the CBD-stone treatment.

1314 Extracorporeal Shock Wave Lithotripsy (ESWL) in Perforated Gallbladder Stones

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Introduction. Spontaneous gallbladder stone perforation with stone migration into the digestive tract may necessitate surgical intervention, mostly due to intestinal obstruction. We report three such cases in whom open surgery could be avoided.

Patients, method. In the three patients reported, the typical features of gallstone perforation were distributed as follows: high age (70 years and more), female sex in two, episodes of severe upper abdominal pain followed by a symptom-free interval in two, symptoms of high intestinal obstruction and aerobilia in all three cases. Endoscopy revealed stones either occluding the duodenal bulb or being half-born from a cholecysto-duodenal perforation. Since in all these stones endoscopy failed, US-guided ESWL was performed (MPL 9000, Dornier/Munich, one to three sessions with sedo-analgesia).

Results. Stone disintegration without problems or side effects was possible in all cases. The fragments either passed spontaneously (2 cases) or needed additional endoscopic removal. Intestinal obstruction resolved immediately. All patients remained free from biliary symptoms, and there was no recurrent bleeding either. Aerobilia was observed persistently, and in all patients a shrinking of the gallbladder was noted as demonstrated by US.

Conclusion. ESWL can be the therapy of first choice in gallstone perforation, avoiding open surgery.

1315 Extracorporeal Shock Wave Lithotripsy (ESWL) in Problematic Extrahepatic Bile Duct Stones – A Nine Years Experience

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Introduction. Extrahepatic bile duct stones (BDS) are routinely subjected to endoscopic sphincterotomy (EST) and stone extraction. In about 5%, however, endoscopy is either not successful (e.g., stone burden too big, limited size of sphincterotomy, diverticula), or endoscopy is not possible (e.g., strictures, postoperative conditions such as partial gastrectomy, Roux-Y-anastomosis).

Method, patients. ESWL was performed with ultrasound- or X-ray directed electrohydraulic systems (Dornier/Munich). The 364 patients treated received general anesthesia in the early phase only, later on sedoanalgesia turned out to be sufficient. Stone size ranged from 10 to 45 mm, stone number from one to more than 20. In all patients carrying an endoscopically accessible papilla, EST and at least one attempt of endoscopic stone extraction had been performed. Fragments passed either spontaneously or were extracted. The stone-free condition was demonstrated by endoscopy or by percutaneous transhepatic cholangiography. Repeat sessions – up to seven in one case – were necessary in 77.5% of the patients treated. The number of shock wave impulses was limited to 2000 per session.

Results. Fragmentation and stone-free bile ducts were achieved in 96.4% (351/364); failures occurred in chronically impacted stones surrounded by inflammatory tissue layers splitting the shock wave before reaching the stone surface. No complications were noted.

Conclusion. Unlike gallbladder stone ESWL, BDS-ESWL can be carried out in all stone types. It is as beneficial and successful as shock wave treatment

of urinary tract calculi. Higher energy levels, however, are needed (including a high percentage of repeated ESWL sessions) in BDS-ESWL as compared to urological ESWL.

Problematic BDS not treatable by or not accessible to endoscopic treatment are removable safely and easily from the extrahepatic bile ducts by means of ESWL; open surgery is no more needed for these conditions.

1316 Extracorporeal Shock Wave Lithotripsy (ESWL) in Problematic Extrahepatic Bile Duct Stones Without Prior Endoscopic Sphincterotomy (EST)

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Introduction. Since gallstone fragments after ESWL up to 8 mm in length can pass the papilla spontaneously, we performed ESWL of extrahepatic bile duct stones (BDS) without EST in a subset of patients.

Patients, method. In these 26 patients suffering from solitary or up to three small (8–12 mm) BDS, EST was either impossible due to specific anatomical situations (non-accessible papilla after partial gastrectomy) or EST seemed to be risky (iuxtapapillary diverticulum) or avoidable (especially in young patients). BDS were predominantly cholesterol stones as evaluated by ultrasound (Tsuchiya type I); in four cases, BDS were "residual" after cholecystectomy. ESWL was carried out by an ultrasound directed electrohydraulic system (MPL 9000, Dornier/Munich) performing one to three sessions in sedoanalgesia.

Results. Fragmentation of BDS was possible in all cases; spontaneous and complete clearance of the bile duct through the intact papilla was achieved in 23 patients as demonstrated by ultrasound and ERC. In two cases, a mild and spontaneously resolving pancreatitis was observed.

Conclusion. In highly selected cases, ESWL without prior EST is possible and especially helpful in patients with a non-accessible papilla or in young individuals in whom it is desirable to maintain an intact papilla of Vater. This new approach is an efficacious and safe modality to avoid EST or (re-)operation in patients suffering from small solitary (or up to three) small bile duct stones.

1317 Octreotide Prolongs Intestinal Transit in Acromegalic Patients – A Key Event in the Pathogenesis of Gallbladder Stones (GBS)?

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Background: Octreotide (OT) induces GBS in up to 60% of acromegalic patients. Impaired GB emptying and lithogenic changes in bile composition and physical chemistry – possibly secondary to a rise in the % deoxycholic acid (DCA) in bile – contribute to formation of OT-induced GBS. The rise in the % DCA could be due to prolongation of intestinal transit permitting increased bacterial 7 α dehydroxylation of cholic acid to form DCA. **Methods:** To study this, in 6 non-acromegalic controls and 8 non-OT treated acromegalic patients, we used a randomised, double-blind, placebo-controlled (saline SC), crossover design, to examine the effects of a single dose (50 μ g) of OT, given 30 min before a fat-rich liquid meal containing 20 ml of lactulose, on the mouth-to-caecum transit time (MCTT) measured by breath hydrogen excretion. In 10 non-acromegalic controls and 7 non-OT treated acromegalics, we also used radio-opaque marker shapes to compare large bowel transit time (LBTT). **Results:** Before OT, the mean MCTT (171 \pm SEM 17.9 min) and LBTT (38 \pm 10 h) were greater in acromegalic patients than in controls (108 \pm 22.9 min, $p < 0.05$ and 22.4 \pm 4.6 h, NS; respectively). OT markedly prolonged the MCTT to 230 \pm 20.4 min ($p < 0.009$) in the controls and to > 300 min ($p < 0.002$) in all acromegalic patients, the effects in acromegalics being significantly greater than in controls ($p < 0.004$). **Summary:** (i) The MCTT and LBTT are greater in acromegalic patients than in controls. (ii) OT prolongs MCTT in both controls and acromegalic patients, an effect more marked in acromegalics. **Conclusion:** The results support the hypothesis that OT prolongs intestinal transit, thus leading to a rise in the % biliary DCA and the formation of lithogenic bile which, together with impaired GB emptying, induces GBS formation.

1318 Preoperative Local Infiltration with Ropivacaine for Postoperative Pain Relief After Cholecystectomy

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Relief of postoperative pain is of great concern to patients and surgeons. Different treatment modalities have been used, e.g. opioids, regional anesthesia and local infiltration anesthesia. For inguinal herniorrhaphy Tverskoy et

al. have showed that addition of preoperative infiltration of bupivacaine along the line of incision reduces postoperative pain, compared to general or spinal anesthesia alone. It is hypothesized that local anesthesia by neural blockade prevents the nociceptive impulses from reaching the central nervous system. The formation of the sustained hyperexcitable state responsible for the maintenance of postoperative pain may thereby be suppressed.

Methods: In a randomized, double-blind, placebo-controlled trial, we evaluated the use of preoperative local anesthesia with regards to postoperative pain. In 66 patients scheduled for cholecystectomy, the abdominal wall along the proposed line of incision was infiltrated with 70 ml of 0.25% ropivacaine, 70 ml of 0.125% ropivacaine or 70 ml of saline prior to surgery. Wound pain at rest, wound pain during mobilization, and pressure exerted to reach maximum pain tolerance was assessed after 6, 26, 50 and 74 hours and after 7 days. Consumption of analgetics was recorded.

Results: At the 6 hours assessment there was a statistically significant dose-related decrease in wound pain during mobilization ($p = 0.001$) and increase of pressure exerted to reach maximum pain tolerance ($p < 0.001$). There were no significant differences between the groups at later pain controls. The median time to first request for postoperative analgetics was significantly shorter ($P = 0.014$) in the saline group than in the ropivacaine 0.25% group.

Discussion: The early effects at the 6 hour assessment are suggested to be a residual anesthetic effect of ropivacaine. The study gives no support to the hypothesis that preoperative local anesthetics dampen the inflammatory response and ensuing hyperalgesia. Difference in magnitude of surgical trauma in cholecystectomy compared to herniorrhaphy may explain the contradictory results to other investigators. Further studies are needed to establish the role of preoperative local infiltration for postoperative pain relief.

1319 Intra-Corporeal Electro-Hydraulic Lithotripsy in the Treatment of "Problematic" Gallstone Disease

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Intra-corporeal electro-hydraulic lithotripsy represents an acknowledged alternative treatment of gallstone disease where it finds its principle indication in "problematic" cases, either after failure of traditional endoscopic therapy or as an alternative to surgical, radiologic, extra-corporeal, chemolitholytic, or intra-corporeal laser therapies. The technique involves pulverization of gallstones by means of shock (or pressure) waves induced in salt solution by an electrical phenomenon (spark) produced by two co-axial electrodes (probe) which pulverize the stone upon direct contact, achieved by means of a cholangioscope inserted into the biliary tract by either peroral transpapillary cholangioscopy or percutaneous trans-hepatic cholangioscopy in the latter case via creation of a fistula tract and percutaneous internal-external bile drainage. From January 1990 to September 1993, 38 patients (20 males and 18 females, 18 to 81 years old) with "problematic" gallstone disease underwent intra-corporeal electro-hydraulic lithotripsy. Of these patients, 19 had gigantic stones, 6 had multiple stones in the extra-hepatic bile ducts, and 13 had stones in the intrahepatic bile ducts. Thirty patients had already undergone extra-hepatic bile duct surgery for stones, and 6 had already undergone a Billroth II resection. Sixteen patients underwent peroral transpapillary cholangioscopy; 22 patients in whom such an approach was deemed either unfeasible (hepatico-jejunal anastomosis), extremely difficult (previous resection), or had been unsuccessful, underwent percutaneous trans-hepatic cholangioscopy. Biliary tract lavage was achieved after 1 to 3 procedures (in 80% of patients, 2), with neither morbidity nor mortality. Complete clearance was attained in 97.4% of patients. After 6 to 36 months, there was neither clinical, endoscopic, nor radiologic evidence of cholestasis or relapse of gallstone disease in 97.4% of patients. Intra-corporeal electro-hydraulic lithotripsy is, in our opinion, highly successful in disintegrating stones and achieving complete clearance of the stones. Those stone fragments not able to be thus disintegrated were removed by means of a Dormia basket under direct cholangioscopic vision. Also, its indications are not constrained by type or site of stones, or by the calcium concentration of the stones themselves. In terms of cost-benefit, this technique, albeit expensive, offers several advantages with respect to surgery or other non-traditional therapies as regards length of hospital stay, morbidity, and mortality.

1320 Gallstone (GS) Characteristics and Gallbladder (GB) Emptying in an Elderly Resident Population

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Information about GS disease in the elderly is limited. We first studied by US the characteristics of GS in an elderly resident population (mean age: 70.0 \pm

6.7 ys; range 60–86) of the North-east of Italy. Then, to investigate GS composition, GS carriers underwent a plain abdominal radiograph and CT scanning. Moreover, fasting GB volumes (FV), GB emptying (GBE) and residual volumes (RV) were studied by US in 56 non-obese, non-diabetic GS carriers and in a similar group (n = 21) of GS-free elderly subjects. *Results:* 102/949 subjects had GS (10.7%) and 88.2% of these were asymptomatic. Seven subjects had biliary sludge and another 15 presented GB wall lesions. Multiple GS accounted for 62.7%, whereas GS with a diameter <15 mm were seen in 52%. Plain X-ray GS calcifications were present in 29/91 GS carriers (32%), absent in 58% and not well defined in another 10%. CT (n = 61) revealed GS calcifications in 22 subjects with a negative/inconclusive conventional radiograph. CT density values <50 Hounsfield Units (HU) were found in 35 subjects, >50 and <90 HU in 6 and >90 HU in 20. In GS carriers FV were 38.9 ml \pm 2.6 SEM vs 22.1 \pm 2.0 in GS-free subjects (p < 0.01). As GBE was similar in the two groups, (46.0% \pm 2.9 vs 41.5 \pm 2.6; p = ns), RV were also greater in the elderly with GS than in those without GS (18.2 ml \pm 1.9 vs 8.8 \pm 0.8; p < 0.01). *Summary and conclusions:* i) 2/3 of elderly GS carriers have multiple GS, 54% show calcified GS (plain X-ray + CT >90 HU), whereas nearly 40% are likely to have cholesterol GS (CT <50 HU); ii) on average, FV are increased and GBE are normal in non-obese, non-diabetic elderly GS subjects. Thus, the characteristics of the GS and the GB in the elderly are similar to those reported in adult (<60 ys) GS populations.

1321 Paramagnetic Centers in Gallstones

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Gallstones dissolution capacity is dependent by the composition of the stones.

Aims: The author present first experiences in vitro with used Electron Spin Resonance spectroscopy (ESP) as a test for the determine gallstones types and control test for the gallstones dissolution.

Material and methods: The stones were classified in cholesterol (cholesterol more than 70%) (Ch) – 16, mixed cholesterol more than 30%, less than 70%) (Mx) – 20 and pigment (Pg) – 10. ESP spectrum records were made at 18–20°C in the air. Measurement were made on a conventional RE-1301. Radiospectrometer equipped a high power microwave radiation source, Mgo power containing trace amounts of Mn²⁺ and Cz²⁺ was used to identify magnetic microwave field characteristics. In gallstone's powder was determined fluorescently lipid peroxidation products (FLPP) and pigment contents. Gallstones dissolution were realization with methyl-tert-butyl-ether (MTBE), Na-saltdeoxycholic acid 4.3%, pH 7.4–8.0 (Ch. A).

Results: Mixed and pigment stones had paramagnetic signals of Mn²⁺, Fe³⁺ and Cu²⁺. All gallstones types had the ESP signal with narrow line 8.5–10.8 gauss and connecting related magnetic field strength at 2.041–2.049. Saturation behavior and narrow line supports the assignment of the organic paramagnetic centers (OPC) in all gallstones types, it was found pigment stones have extremely high OPC – 2.0–5.5 \times 10¹⁸ sp/g; mixed – 2.0–5.0 \times 10¹⁷ sp/g. Significant correlation was found between OPC concentration (sp/g), pigment (g/g) r = 0.87 and FLPP (RED/g) r = 0.69 in gallstones. Pire bilirubin not had paramagnetic signal at the same measurement condition. OPS is impermeable to dissolution agent as MTBE and ChA.

Conclusion: Electron Spin Resonance spectroscopy is the novel method for the nondestruction identification gallstone kinds. Organic paramagnetic center remain unchanged at in vitro gallstones dissolution.

1322 Acute Tissue Response of Biliary and Gastrointestinal System to Methyl Tertiary Butyl Ether (MTBE) Infusion into the Gallbladders of Rabbits

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New approaches has been recently introduced in treatment of gallstones. Gallstone dissolution with MTBE, one of these new technics, has been applied by some centers.

In this study, we planned to determine the acute tissue response of biliary and gastrointestinal system to MTBE, an excellent cholesterol-solubilizing agent. 8 New Zealand type rabbits were studied. 5 F biliary drainage catheter was surgically sutured into the gall bladder of rabbits. Immediately after laparotomy, MTBE was manually instilled into the gallbladder in aliquots of 0.5–0.7 ml for 6 hours. Saline solution was instilled into the gallbladder of control animal via the catheter. Animals were sacrificed after 6 hours.

On light microscopy, rabbits treated with MTBE had different degrees of gall bladder and common bile duct necrosis, proprial hemorrhagia and edema. Control animals received saline solution showed small hemorrhages and necrosis in the gall bladder. The severity of necrosis were extremely high in the MTBE treated rabbits compared with the controls.

MTBE application produced severe acute side effects in our rabbit study. Although the results of this animal study can not be directly transferred to hu-

mans, the data suggest that MTBE should be used in gallstone therapy with caution; if it is used, a well-controlled follow-up of these patients is necessary.

1323 Investigation of Cholelitholytic and Biologic Effects of Methyl Tertiary Butyl Ether (MTBE) in Dogs with Implanted Gallstones

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Recently, several nonsurgical approaches are increasingly more popular in treatment of patients with gallstones especially having operative risks. One of these new technics is gallstone dissolution with MTBE. Although minimal anesthetic effect, vomiting and hemolysis due to MTBE had been defined, tissue response of biliary system, liver and duodenum has not been well-known.

In this study, we planned to determine acute biologic and biochemical effects on animal models before clinical application of MTBE. 7 mongrel dogs (one control, 6 with implanted gallstone) were studied. Gallstones with equal number and size were surgically implanted to dogs and 5F catheter was sutured into gall bladder. Seven to 10 days after surgery, MTBE was manually instilled into the gall bladder via the catheter in aliquots of 5–10 ml. Stone diameter was measured using serial ultrasonography and scopy.

At necropsy, dogs had fragmented and reduced sized gallstones and residual debris in the gall bladder. In some dogs, the gall bladder and common bile duct mucosa showed small hemorrhages. It was thought that nonspecific inflamatory changes of gall bladder could have resulted from the surgical procedures for the placement of the catheter and gallstones, catheter, gallstones or the MTBE.

As a result, despite of considerably difficult clinical toleration, mild to moderate tissue response in biliary system and minor biochemical changes, MTBE is an excellent cholesterol-solubilizing agent.

1324 Epidemiology of Cholelithiasis in Southern Italy

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The aim of this study is to describe the prevalence and incidence of gallstones within a population sample from a typical Mediterranean area.

A sample of 3500 subjects, 2000 males and 1500 females, within the age range 30–69 years, was drawn by systematic sampling from the electoral poll of Castellana, a small town in the region of Apulia in Southern Italy.

Between May 1985 to June 1986 two thousand four hundred and seventy-two subjects, (1429 males and 1043 females), had their gallbladders checked for gallstones by ultrasound (70.6% response).

Two hundred and twenty-six of them (92 males and 134 females) had gallstones, a prevalence of 9.2% (6.5% in males and 12.9% in females).

From May 1992 to June 1993, 1962 of the subjects without gallstones (87.7%) agreed to be reexamined, again by ultrasound. One hundred and four subjects, 55 males and 49 females, had developed gallstones, an incidence rate of 7.9 per 1000 person-years, 7.1% in males and 9.1% in females.

Prevalence increased with age in both sexes and were higher in females than in males in all ages.

The findings of this study suggest that while in this town of Southern Italy the prevalence of cholelithiasis is lower than or equal to that in Central-Northern Italy and Denmark, the incidence is respectively equal or higher, so probably the town's population is losing lifestyle habits which protected it from gallstones.

1325 Diabetes as a Risk Factor for Gallstones. Results of a Cohort Study in Southern Italy

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Gallstones and diabetes are common diseases in the western developed countries, but their relationship is still uncertain.

Aim of this study is to evaluate the association between diabetes and gallstones in a population cohort study on risk factors of gallstone occurrence.

In 1985-86 a random sample of 1429 males and 1043 females (70.6% response) in the age range 30–69 years, from the electoral poll of a town in Southern Italy, was examined for gallstones by ultrasonography. They re-

ceived also a questionnaire asking for actual diseases and therapies. A blood sample was drawn for dosing serum cholesterol, HDL-cholesterol, triglycerides, glucose by standard methods (CV less than 5%). Diabetes was a referred diagnosis of diabetes or taking drugs for diabetes or glycemia > 140 mg/100 ml. Ninety two males (6.9%) and 134 females (12.9%) had gallstones or were operated on for gallstones; 112 males (7.8%) and 65 females (6.2%) had diabetes. In 1992-93, 1962 of the subjects without gallstones (87.7% response) agreed to be reexamined, again by ultrasound. One hundred and four subjects, 55 males and 49 females, had developed gallstones, an incidence rate of 7.9 per 1000 person-years (7.1% in males and 9.1% in females). Diabetes at the prevalence study was associated with incident gallstones: odds ratio (OR) 3.1 (95% CI 1.8-5.5). The association diabetes-gallstones persisted also after controlling for age, sex, BMI, cholesterol, HDL-cholesterol, and triglycerides by logistic regression: OR = 2 (95% CI 1.1-3.7). Age, BMI, and HDL-cholesterol (inverse relationship) were also independent risk factors of gallstones.

The findings of this study show that diabetes is associated with incident gallstones.

1326 Improved Efficacy of Electrohydraulic Lithotripter by the Use of Conducting Water

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Extracorporeal lithotripsy is now scarcely recommended for the treatment of gallbladder lithiasis. One reason for this disfavour is the inability of shock waves to satisfactory fragment the biliary stones. We tested a new electrohydraulic generator in which the electric discharge is produced in conducting water (CW) which allows the shock wave formation to be controlled: The pressure at the focal point is stable and always maximal and the focal point is reduced in size. This generator theoretically combines the advantages of electrohydraulic (power) and piezoelectric (precision) lithotripters. *In vitro study*: 30 pairs of stones were used (cholesterol: 25, bilirubin: 3, mixed: 2) (diameter: 7-15 mm, mean: 10.5). Stones from the same pair were obtained from the same gallbladder and looked identical (diameter, shape, components, weight). The first stone of a pair was fragmented using an electrohydraulic lithotripter (Technomer Diatron) with usual deionized water and the second using the same generator with CW. Fragmentation conditions were identical (stone at the focal point in a container). The number of shock waves to obtain fragments with a diameter less than:

- 5 mm was 168 + 48 with CW and 1150 + 188 without ($p < 0.05$)
- 3 mm was 313 + 59 with CW and 1850 + 193 without ($p < 0.05$)

Clinical study: 17 patients with a unique stone less than 20 mm in diameter (moy: 13 mm) were treated using CW. In one session (moy: 1073 shock waves), 15 patients (88%) had fragments less than 5 mm in diameter. This result is better than the previous result (49%) obtained with the same generator but with deionized water (moy: 2050 shock waves) (Gastroenterol 1990)

Conclusion: Use of conducting water instead of deionized water dramatically improves the *in vitro* efficacy of an electrohydraulic lithotripter. First clinical data confirm these results.

1327 HPLC Determination of D-Glucaric Acid in Common Duct Bile of Patients Investigated by ERC

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Background: Enzymatic deconjugation of conjugated bilirubinate has been suggested to be of importance in the pathogenesis of gallstones. β -glucuronidase is normally (human) and pathologically (bacterial) occurring in bile. This enzyme is susceptible to inhibition by a normal constituent of bile: D-glucaric acid (DGA) which might contribute to bilirubinate deglucuronidation. The aim of this study was to establish a method for quantification of biliary DGA.

Material and Methods: Bile was aspirated during ERC from 42 patients investigated for suspected biliary disease. 200 μ l of the bile was freeze-dried and stored at -20°C until analysed. The sample was diluted in 1 ml mobile phase and filtered to remove proteins and large molecules. 20 μ l of the filtrate was injected on an Aminex HPX-87H column kept at 30°C . The mobile phase was sulphuric acid 0.009 mol/l and the flow rate 0.6 ml/min. Data from UV-detection at 210 nm was acquired and chromatograms integrated on a PC. Spiking with ^{14}C -DGA and collection of peaks were used to assess recovery.

Results: Recovery was $95 \pm 9.5\%$ (mean, SE), $n = 4$. Mean DGA in 42 bile samples was 82 $\mu\text{mol/l}$, range 12-255. No correlation was found to bilirubinate conjugates, biliary pH, bacterial growth in bile or presence of gallstones.

Conclusion: DGA in common duct bile is much lower than has been reported for gallbladder bile. We did not find support for the etiological importance of DGA in gallstone disease.

1328 Asymptomatic Gallstones in the Elderly: Preliminary Data of a Multicenter Prospective Study

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An increased incidence of gallstone disease in the elderly as compared to young adults has been reported in the literature. While in young adults the asymptomatic gallstone disease seem to be benign and medical and surgical treatment is contraindicated, in the elderly the natural history is not known. Some authors suggest a more aggressive approach in these subjects since the mortality for complications and the operator risk seem to be higher as compared to the general population, but no prospective studies are reported to support such a hypothesis.

The aim of this study was to evaluate the natural history of the asymptomatic gallstones in the elderly. We enrolled 167 subjects aged more than 65 years (males 51, females 116, mean age 76, range 65-98) with asymptomatic gallstones, diagnosed by ultrasound, in a multicenter prospective study. At the admission the following data were recorded: body weight, alcohol intake, coffee and cigarettes consumption, number of pregnancies, use of oestrogenic drugs, family history of gallstones and diabetes, number and diameter of the stones, routine blood tests. All subjects were followed up every six months by means of clinical and biochemical evaluation.

126/167 patients had a six months follow-up: 6/126 (4.7%) died for diseases not related to gallstones; 4/126 (3.1%) presented biliary pain which required medical (1 case), endoscopic (1 case) or surgical (2 cases) treatment. No morbidity or mortality was noticed after treatment. 86 reached the twelve month control: 3 pts (3.4%) had died from diseases not related to gallstones, 1 pts (1.1%) was submitted to surgery. At 18 months 48 subjects were checked: 2 (4.1%) died from diseases not related to gallstones and 1 (2%) presented biliary pain treated medically.

These preliminary results indicate that asymptomatic gallstones in the elderly seem to become symptomatic in a low number of cases and to present rarely complications, suggesting that a conservative approach could be preferred. A longer follow-up is necessary to confirm these results.

1329 The Prevalence of Gallstone Disease in Old Aged Institutionalized Subjects

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Ultrasound data on gallstone disease prevalence in old aged subjects has been published from several countries but not from Romania. The aim of this study was to determine the prevalence of both symptomatic and silent gallstone in the old institutionalized persons.

All residents from two large geriatric nursing homes in Iaşi (North-East of Romania) aged over 65 years were invited to participate in the study and each subject underwent real time ultrasonography after having a complete history and physical examination. Of 272 subjects invited, 247 attended: 106 men and 141 women, managed 74.6 years (range: 65-94 years).

Seventeen (16%) of 106 men and 46 (31%) of 141 women had gallstone disease, including those who had previously cholecystectomy. The prevalence increased with aged and peaked between the age of 76 and 80 years. In women 26% had biliary pain, as contrasted to only 11% of men.

In conclusion, the prevalence of gallstone disease in an old-aged institutionalized population in north-eastern Romania was found to be unexpectedly high for this country.

1330 Antegrade Enema. The Useful Appendix

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Antegrade colonic irrigation is recognized as a useful alternative for pre-operative and on table colonic preparation. The paediatric surgeon Mitrofanoff introduced some years ago the use of appendix for making a continent stoma. Malone adapted the Mitrofanoff principle. The appendicostomy has since that time been used in our paediatric unit with promising results for antegrade irrigation of colon in children with chronic intractable faecal incontinence, as well as a mean to control soiling and faecal leakage following different anorectal anomalies. We describe how the technique has now also been adapted to use in an *adult* in our department.

A 21 years old woman had been operated on as a newborn with a "pull through" operation for a high anal malformation. A persistent faecal incontinence could not be controlled by later attempts at reconstruction of the anal sphincter muscle. She had for many years controlled her bowel function by retrograde irrigation, but found this procedure no longer tolerable. As an alternative to a sigmoideostomy an appendicostomy was fashioned, thereby