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IMPACT OF INTRAOPERATIVE ULTRASONOGRAM IN DRAINAGE SURGERY FOR CHRONIC PANCREATITIS

Hepatobiliary Surgery

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ABSTRACT

Introduction: Surgery for chronic pancreatitis involves ductal clearance, identification of cystic lesion and mass lesion. Intra operative ultrasonogram (IOUS) is useful in surgery for chronic pancreatitis.

Aim: To analyze and assess the impact IOUS in drainage surgery for chronic pancreatitis.

Methods: IOUS was performed in patients with chronic pancreatitis(GpI) compared with control group wit out IOUS (Gp II) which were similar . The outcome measures were analyzed and compared.

Stastical analysis: SPSS 14 version was used, student t test, chi square test, Fiser exact probability test were used appropriate. P value of <0.05 was considered significant.

Results: IOUS proved beneficial in identifying intra ductal calculi, undrained cyst , identification of pseudoaneursym, mass lesion and to do IOUS guided FNAC I.

Conclusion: Clearance of ductal calculi, drainage of cyst was more complete with IOUS (Gp I) and found to be useful in patients undergoing drainage surgery for chronic pancreatitis.

KEYWORDS

Chronic Pancreatitis, Ductal Clearance, Intra operative Ultrasonogram

INTRODUCTION

Surgery for chronic pancreatitis involves, localising the calculi, identification of duct and cystic lesion, assessment of associated mass lesion & its relationship to vascular structures. In recent years, the preoperative assessment of chronic pancreatitis has been significantly improved by use of imaging techniques such as ultra sonogram (USG), computerised tomography (CT), magnetic resonance imaging (MRI), endoscopic retrograde cholangio pancreaticogram (ERCP) and endosonogram (EUS) has greatly facilitated surgical management of chronic pancreatitis. To complement direct exploration, operative imaging can be used in the operating room to enable the surgeon to attain further information about the clinical problem and intra operative ultrasonogram (IOUS) is useful during surgery for chronic pancreatitis[1]. In addition to diagnosing and better defining abnormalities for drainage, is able to detect previously unsuspected associated pathological conditions such as second pseudocyst and knowledge of such associated lesions may permit their management at the primary operation[2]. 15% of patients with chronic pancreatitis have recurrent pain following primary operation and that this lack of success is relatively consistent across all large surgical series regardless of the etiology of chronic pancreatitis, type of primary operation applied, or geographic region in which the operation was performed[3, 4]. Technical factors and or inappropriate operative strategies have been suggested to be a major contributor to early postoperative failure[5]. In this study we have sought to analyze and assess the impact of Intra Operative Ultra Sonogram in drainage surgery for chronic pancreatitis.

MATERIALS & METHODS

Hundred two patients with chronic pancreatitis who underwent drainage procedures, longitudinal pancreatico jejunostomy (Partington & Rochelle modification of Peustow procedure[6]) and Frey's procedure[7] between Jan 2005 and Dec 2008, in Surgical Gastroenterology department, Government Stanley Medical college Hospital, Chennai, India constituted the study population. For the prospective study, 51 patients were studied who had IOUS during surgery between Jan 2007 and Dec 2008 (n=51) (Group I). The control groups consisted of patients who did not have IOUS during surgery between Jan 2005 and Dec 2006 (n=51) (Group II).

Data was obtained during the hospital admissions as well as during follow-up at outpatient department by face to face interview or telephonic interview. Follow up period ranged from 12 to 51 months. The diagnosis of chronic pancreatitis was made on the basis of history of typical abdominal pain & pancreatic parenchymal changes, ductal dilatation & calcification on imaging (USG, CT & MRCP)[8]. Inclusion criteria included presence one or more than one of following, severe recurrent pain attacks (at least 1per month requiring opiates) , history of pain attacks for at least 1 yr, dilated main pancreatic duct (MPD ≥8 mm)[9], inflammatory head mass(≥35 mm)[10], and coexisting complications from adjacent organs (Biliary stricture, Duodenal stenosis, Pseudoaneurysm). Patients with small duct disease, pancreatic carcinoma, pancreatic fistula and portal vein thrombosis were excluded.

Tropical pancreatitis (TP) was defined as chronic pancreatitis with younger age of onset, malnutrition, rapid progression, severe pancreatic damage, large ductal calculi, and without any evidence of other known etiolological factors [11]. Alcoholic pancreatitis (AP) was defined as chronic pancreatitis associated with consumption of greater than 150gm/day units of alcohol for at least 5 years[12].

Surgical factors which would have interfered with the outcome were documented. These included: duration of surgery, estimated blood loss (EBL) during surgery, post operative hospital stay, morbidity, mortality and the usefulness of IOUS. For the outcome of surgery, relief of pain, steatorrhoea and details of diabetes were recorded. Pain assessment was done using the visual analogue scale (VAS), frequency of pain attacks, the need for analgesics, and time of disease-related inability to work[13]. Patients with pain score of < 12 were considered to have good pain relief and those with >12 and requiring readmissions for pain relief were considered to have poor pain relief[14]. Exocrine dysfunction was based on documentation of stool examination and clinical presentation (frequency of more than three stools per day, foul smelling, greasy and pale stools) [15]. Endocrine dysfunction was considered when blood glucose level were >200 mg/dl at two hours, after an oral glucose load of 75 gm. Weight gain after surgery was considered significant when there was a gain of 5 kg of pre existing weight[16]. Patients with no pain relief underwent USG and or CECT for assessment of residual calculi which was defined as calculi, present after surgery which was evident in the preoperative imaging (USG, CECT).

Surgical strategy:
The surgery in both the group of patients was performed by two experienced surgeons. Frey's procedure was the choice when there was an associated inflammatory head mass; longitudinal pancreatico jejunostomy (LPJ) was done in a normal sized head of pancreas.

In the prospective study, IOUS was performed by gastrointestinal radiologist using a 10 MHz dedicated intraoperative Doppler probe after probe sterilisation as recommended by the manufacturers and after complete mobilisation and exposure of pancreas. The surgeon was given an overview of location of the ductal calculi, cyst and pseudo aneurysm its relationship to vascular structure. Ductal clearance of stone was done. IOUS was repeated just prior to anastomosis soon after ductal exploration to ascertain the completeness of ductal clearance. IOUS guided FNA was done when suspicious lesion with altered echo texture was identified.

Intraoperative IOUS was considered beneficial, if the procedure could identify and locate the main pancreatic duct and calculi (which was not removed before anastomosis), a pseudo aneurysm, an undrained cystic lesion, or if an FNAC was possible from a mass lesion suspicious of malignancy.

STATISTICALANALYSIS:
Data were reported as mean ± SD .Continuous variables such as age, MPD size, duration of surgery, estimated blood loss (EBL) in surgery & pain score were analysed using student T test. Categorical variables such as, sex, etiology, pain relief, new onset diabetic status, new onset of steatorrheoa, weight gain & presence of residual calculi were analysed using Chi square test& Fisher exact probability test. The data were analysed using a statistical software package (SPSS 14 version for windows). A p-value of less than or equal to 0.05 was considered statistically significant.

RESULTS:
Hundred and two patients were enrolled in the study. Preoperative details of the patients are shown in Table 1. Both patient groups were comparable in terms of demography, aetiology and pancreatic morphology. In Group I (IOUS), 38 patients had an inflammatory head mass and 3 suspicious malignant lesions at IOUS; at FNA, in 2, the mass was inflammatory and in one the specimen was positive for malignancy. The latter patient had a Whipple's procedure. This patient who underwent Whipple's procedure was excluded from the study.

In Group I, 35 (70%) patients had tropical pancreatitis and 15 (30%) had alcoholic related chronic pancreatitis, while there were 33 (64.7%) and 18 (35.3%) respectively in Group II. The mean age of occurrence, duration of symptoms, details of diabetes, presence of steatorrhoea and details of surgery in the two groups are shown in Table I. The duration of follow up in IOUS group was 17.0 ± 4.38 months and in non IOUS group 35.28 ± 8.20 months. **(Table 1)**

IOUS was beneficial in 39 (76.5%) patients **(Table 2)**. It detected suspicious mass with altered echo texture not detected by preoperative imaging in three patients and altered the management in one patient(positive for malignancy), located calculi in 28 patients, identified an undrained cyst in 3 patients, localised pseudoaneursym in 2 patients, in 3 patients it identified calculus as well an undrained cyst. Mean duration of surgery in Group I was more though not statistically significant (217.6 ± 22.30 min vs 205.20 ± 22.60 min). Blood loss was less in Group I though not statistically significant compared to Group II (255.60 ± 74.05 ml vs 272.45 ± 87.81 ml). There was no hospital mortality in both the groups. Morbidity in both groups were similar (Group I: 11 (22%) vs Group II: 14 (27.4%). Both groups had minor pancreatic leak in one patient each and were managed conservatively. Other complications included surgical site infection and pulmonary complication which were managed appropriately. The Post-op stay in the hospital in both groups of patients was similar (Group I 11.86 ± 2.83 days vs Group II: 12.22 ±3.51 days). In Group II, one patient developed post-op bleed from gastro duodenal artery which required re-exploration and suture ligation of the bleeding vessel. 43 (86%) patients and 40 (78.43%) in Group I and Group II had pain relief respectively. Patients with no pain relief , showed residual calculi in 1 out of 7 patients in Group I and in Group II 8 out of 11 patients. **(Table 3)**

Three of the 19 patients with diabetes in Group I, three became non diabetic post operatively; these patients had TP and duration of diabetes was 6 months. In 6 patients new onset of DM was noticeable during the follow up period. In Gp II, 20 of the 21 patients continued to be diabetic. One patient with TP and one year diabetic state became non diabetic. In 10 patients new onset of DM was noticeable during the follow up period.

The occurrence of steatorrhoea following surgery in Group I and II is shown in Table 3. In Group I, 8 patients (TP: 7, AP: 1) developed steatorrhoea, 6 after Frey procedure, 2 after LPJ. In Group II, 12 patients (TP: 10, AP: 2) developed steatorrhoea after surgery (Frey procedure: 9, LPJ: 3). Post operatively, the weight remained constant in 18 patients in Group I and 12 in GP II. In Group I, 25 patients gained weight and 7 lost weight and in group II 28 patients gained weight and 11 lost weight.

DISCUSSION:
In recent years, the preoperative assessment of chronic pancreatitis has significantly improved using ultra sonogram, computerised tomography, magnetic resonance imaging, endoscopic retrograde cholangio pancreaticogram and endosonogram. These have greatly facilitated surgical management of chronic pancreatitis. To complement this, direct exploration and intra-operative imaging can further improvise on management of these patients. [1]

Overall IOUS was beneficial during surgery in 76.5% of our patients. In the present study, IOUS detected malignancy in one patient, who had a successful Whipple's procedure. Machi et al in a series of 145 pancreatic surgery for chronic pancreatitis found that surgical strategy changed because of IOUS findings in 16.6%[17]. IOUS in the present study could further help in careful dissection of the calculi in the head **(Fig 1)**, uncinate process and in secondary ducts with minimal tissue destruction and also, it was possible to drain cystic lesions **(Fig 2)** 4 in the uncinate process and 2 in the tail.

Bernard Sigel et al in their series found IOUS to be useful in 71.7% of surgery for complications of pancreatitis [2]. Kaczmarek et al reported IOUS is of benefit in 89% of patients with cystic lesions and inflammatory tumours of pancreas[18]. In the present study, IOUS helped to localize retained calculi, undrained cyst and pseudoaneurysm. It facilitated the surgery by reducing tissue traumatisation and blood loss.

Poor pain relief after surgery, including both the groups was 17.8% in our study. The cause of poor pain outcome following drainage surgery for chronic pancreatitis are multi factorial and include inadequate pancreatic duct decompression, biliary stenosis, associated malignancy & neuropathy in pancreatic head [19] . Technical factors and or inappropriate operative strategies have been suggested to be a major contributor to early postoperative failure [5]. In contrast, late postoperative failures are felt to be related to disease progression rather than clinical misjudgement. One of the causes for persistent pain following surgery for chronic pancreatitis is ductal stenosis within side branches[5]. Surgery is considered a complete failure if there is no relief of pain in the immediate post operative period [20]. In analyzing patients without pain relief residual calculi was present in 8 of 11 patients in Group II & and in only 1 of 7 patients in Group I. The presence of less number of residual calculi in IOUS group (Group I) was statistically significant. Pain relief was better when IOUS was performed. This may be related to detection of more calculi and their subsequent clearance as also drainage of small cysts ensuring complete ductal decompression.

Fewer patients developed diabetes in patients undergoing IOUS, possibly due to less tissue destruction. Frey reported 11% of new onset of diabetes in his series of 50 patients followed over a period of 91 months[21]. In a follow up study by Prinz et al, endocrine insufficiency was noticeable in 50% of patients after LPJ over a period of 24 years [22]. Adams reported an incidence of 23% [23] following LPJ.

Preoperative incidence of exocrine insufficiency in our series of patients is 26.4%. New onset of exocrine insufficiency after surgery was 19.6%. This was 16% and 23% respectively in IOUS and non IOUS group. Though statistically not significant this may partly be reflected by minimal tissue loss in IOUS group. Frey reported 11% of new onset of steatorrhoea in his series of 50 patients followed over a period of 91 months[21]. Izbicki et al in 1998 reported an incidence of 6% in their series [24] following LPJ-LHEP. Prinz et al, in 1981, reported exocrine insufficiency in 34% of patients following LPJ and a follow up period of 24 years in 1981[22]. Adams in 1994, after LPJ,

reported an incidence of 34%. A similar rate of steatorrhoea (19.6%) was noticeable in our series.

After surgery weight improved in 52.47% of our patients, it remained the same in 29.70% and decreased in 17.82%. There was no difference in weight gain between the groups 50% in IOUS and 54.9% in non IOUS group; this marginal difference may be because of longer follow up in non IOUS group. Frey et al in a follow up of 50 patients over a period of 90 months reported 64% weight gain, 33% weight loss and no change in weight in 1% [21]. Izbicki et al [25] reported an increase in body weight in 78% following LPJ-LHEP.

Strength & limitation:

There are limited studies in the world literature which have studied the utility of IOUS during surgery for chronic pancreatitis, especially in reference to its benefits in draining undrained cysts in chronic pancreatitis. The present study is the first of its kind in analyzing the benefits of IOUS in drainage procedure for CP. The outcome of surgery following the use of IOUS has been highlighted in this study. Operator dependent observational variations were circumvented in this study as the IOUS was performed by a single interventional radiologist.

The present study was not a randomized controlled trial. Historical group was used as a control; hence the follow up duration was longer in the non IOUS group. This might have some observational errors in outcome.

CONCLUSION:

In our study IOUS was found to be a useful tool in 76.5% patients with chronic pancreatitis. Though statistically not significant, pain relief was slightly better in IOUS group. Patients with poor pain relief, residual calculi were significantly less in IOUS group. IOUS had a significant role in identifying complications like pseudo aneurysm and malignancy thereby altered the management. It increased the rate of stone detection and thereby provided better clearance of the ducts of stones as also aided in drainage of undrained small cysts.

TABLE 1 Demography of IOUS & non IOUS group patients

	Gp I (IOUS)	Gp II (Non IOUS)	p value
Total no patients	50	51	Ns
Male	34(68%)	37(72.5%)	Ns
Female	16(32%)	14(27.5%)	Ns
Tropical pancreatitis	35(70%)	33(64.7%)	Ns
Alcoholic pancreatitis	15(30%)	18(35.3%)	Ns
Age mean ± SD of TP	29.2 ± 11.5	29.81 ± 10.75	Ns
Age mean ± SD of AP	39.54 ± 6.95	41.28 ± 6.74	Ns
Diabetes Mellitus (%)	19(38%)	21(40.3%)	Ns
Steatorrhoea(%)	12(24%)	15(28.8%)	Ns
Pain duration yrs mean	4.26	4.61	Ns
Diameter MPD mean ± SD	9.44 ± 2.74	9.71 ± 2.70	Ns
Frey's procedure	38(76%)	39(76.5%)	Ns
LPJ	12(24%)	12(23.5%)	Ns
Post op stay mean ± SD	11.86 ± 2.83	12.22 ± 3.51	Ns
Follow up mean ± SD	17.0 ± 4.38	35.28 ± 8.20	0.0001

TABLE 2: Benefits of IOUS (51 patients)

Benefits of IOUS in the IOUS gr. (51 patients)	No of patients
Altered management	1
Identified calculi prior to anastomosis	28
Detected undrained cyst	3
Detected both calculi and undrained cyst	3
Localised pseudoaneurysm	2
Detected mass lesion & guided FNA	2

TABLE 3 Post Operative variable analysis

Parameters	IOUS (n=50)	Non IOUS(n=51)	P- value
Duration of surgery (min) Mean ± SD	217.6±22.30	205.20±22.60	ns
Estimated blood loss (ml) Mean ± SD	255.6±74.05	272.45±87.81	ns
Morbidity (%)	11(22%)	14(27.4%)	ns
No. of patients with pain relief (%)	43(86%)	40(78.4%)	ns
New onset Diabetes	6/31	10/30	ns
New onset Steat.	8/38	12/36	ns
Weight gain	25	28	ns
Poor pain relief	7	11	ns
Presence of residual calculi in poor pain relief patients	1/7	8/11	0.049

FIGURE 1 : IOUS picture showing parenchymal calculi

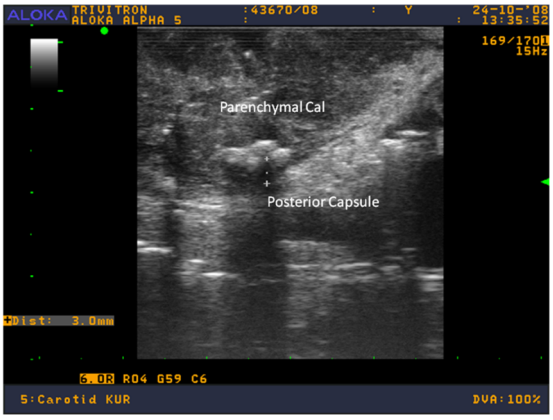
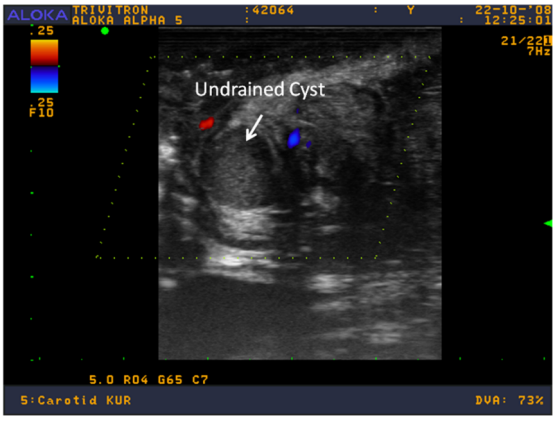


FIGURE 2: IOUS picture showing undrained cyst



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