

Outcome of Pancreatic Head Coring in as Key Surgical Treatment in Head Dominant Chronic Pancreatitis in Tertiary Referral Centers of Bangladesh

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Abstract

Background: Pancreatic head coring procedure, an organ preserving surgery in which diseased head of pancreas is cored with drainage of main pancreatic duct by lateral pancreatico-jejunostomy. Chronic pancreatitis is a persistently occurring inflammatory disease that causes pancreatic duct stones or calcification, stricture, dilatation of pancreatic duct and irreversible morphological changes resulting intractable pain and losses of exocrine and endocrine function. Appropriate management protocol recognizing underlying pathology, can prevent complications and improves the quality of life. Apart from ductal decompression, in Frey's procedure resection of the "pacemaker of pain" (Head of the pancreas) gives excellent outcome.

Methods: In this prospective observational study, we have intended to further validate the Frey's procedure an effective surgical method in head dominant severe chronic pancreatitis. The study was carried out on 106 Bangladeshi patients who underwent Frey's Procedure with Lateral Pancreaticojejunostomy from January 2000 to December 2017.

Result: The study revealed 51 patients (48.11%) were in 3rd decade of life with 45 male and 61 female. We found 77 patients presented with diabetes mellitus, mostly on insulin. Steatorrhoea was noted in 39 patients and Malnutrition in 79 patients. Visual Analog Scale (VAS) was used for scoring pain. Postoperative morbidity was noted in 29 patients 27.35 % cases, but there was no anastomotic leakage or mortality in the immediate postoperative period in our series.

Conclusion: Quality of life has always been the most important decisive factor for patients with severe chronic Pancreatitis. Pain is the predominant clinical feature and very difficult to control. Correction of diabetes and malnutrition are major challenges too. This study revealed, Frey's procedure with adequate ductal clearance with wide pancreato-jejunal anastomosis in head dominant severe chronic pancreatitis is key to better pain control, improves quality of life and prevents recurrence.

Key word: Frey's procedure, chronic pancreatitis, Head coring, pancreatic stone, Lateral Pancreaticojejunostomy, LPJ.

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Introduction

Pancreatic head coring procedure also an organ preserving procedure in which coring of the diseased head of pancreas done along with MPD drainage. Duodenum preserving pancreatic head resection (DPPHR) is the treatment modality in head dominant chronic severe pancreatitis. Frey's Procedure is widely performed procedure in which coring of pancreatic head along with MPD clearance and drainage by lateral pancreatico-jejunostomy. Pancreatolithiasis incidence is less than 1% in CP and 90% patients have pancreatic stones⁵. It is more common in females⁸. Incidence and

presentation varies widely in Europe, North American, USA, South African and Asia⁹. It is a disease of remission and relapse, progressive inflammation of pancreas resulting in irreversible destruction and replacement with fibrous tissue¹. CP is commonly associated with pancreatic ductal stones or calcification, ductal stricture, dilatation with loss of exocrine and endocrine function leading to steatorrhea, malnutrition and uncontrolled glycemic status¹⁻⁴. Recurrent attacks of intractable pain is the predominant feature. Pancreatic enzymes and analgesics are considered as initial medical therapy. Endotherapy was preferred, if medical therapy fails. Surgery was offered to both medical, endotherapy failure and suspected malignancy⁶. Chronic severe pancreatitis of head is considered "*Pacemaker of pain*". The patients usually depend on opioid analgesics. Quality of life is the pivotal factor. Besides ductal decompression, coring of pancreatic head in Frey's procedure, gives excellent outcome compared to other procedures concerning quality of life and long term pain relief.

The objective of the study was to further authenticate improvement in quality of life after Frey's procedure in head dominant CP.

Methods

This retrospective observational study includes 106 patients of head dominant CP, surgically treated with pancreatic head coring Frey's procedure and Lateral Pancreaticojejunostomy from January 2000 to July 2017. Surgeries were performed in BIRDEM General Hospital, Dhaka Medical College Hospital and other hospitals of Dhaka by team of surgeons follow same surgical principle. They were thoroughly evaluated clinically, Visual Analogue Scale VAS for pain scoring and others. Plain x-ray of abdomen (anterior-posterior & lateral view), Ultrasound scan (USG), Magnetic Resonance Cholangiopancreatogram (MRCP), Computed Tomography scan (CT-scan), Carbohydrate Antigen (CA-19.9), Endoscopic Retrograde Cholangiopancreatogram (ERCP) were instrumental to assess pancreatolithiasis, MPD stricture and dilatation, parenchymal changes like fibrosis, atrophy and mass lesions. Patients were briefed perioperatively about VAS, frequently used scale in health care research to assess pain¹¹⁻¹⁷. It is marked with '*No Pain*' to '*Intolerable or worst pain*' at ends and the area in-between were mild to moderate pain.

Non-surgically treated patients like endotherapy with ERCP were also excluded from this study. Patient requiring Whipple's partial pancreaticoduodenectomy and Beger's procedure were excluded from this study.

Surgical approaches

Surgery was indicated in unrelenting pain due to extensive stones, dilated MPD, suspicious mass lesion, failure of medical and endoscopic treatment; associated complications. Basic principle of surgery was to remove duct stone(s), stricture(s) as well as the disease segment and wide pancreato-jejunal anastomosis. In Frey's procedure after opening of MPD, removal of calculi and enucleation of the diseased pancreatic head and uncinate process in contiguity with strictured segment of duct of *Wirsung*. Rim of pancreatic head closed to duodenum was spared along with posterior parenchyma, with or without excising both duct of *Wirsung* and Santorini¹². It saves pancreatic neck and preserved posterior capsule of pancreatic head along with body and tail. In both original and modified Frey's procedures, different depths of pancreatic tissue was cored¹¹. Second generation ducts stones were also removed. Roux-en-Y Longitudinal/ lateral Pancreaticojejunostomy ensured wide pancreatic drainage. Tissues were histopathologically studied to exclude malignancy.

Post-operative period

All patients were thoroughly evaluated clinically, VAS and investigations considering objective and subjective complaints. Started oral feeding between 3rd to 5th postoperative days and discharged between 7th to 21st postoperative days. Diabetic patients had more frequent follow-ups and some needed special care. Good glycemic control was maintained.

Post-operative complication

There are minor and major as well as intra and postoperative complications. Delayed Gastric Emptying (DGE) when nasogastric tube (NGT) required beyond 5th postoperative day, failed to tolerate diet before 7th postoperative day or solid diet before 14th postoperative day. Postoperative Pancreatic Fistula (POPF), when there is clinically significant pancreatic leak with persistent pancreatic fluid drainage or intra-abdominal collection rich in amylase (>3 times serum amylase). Post pancreatectomy Hemorrhage (PPH) was considered as hemorrhage after pancreatic surgery.

Follow up

All 106 patients were followed up till July 2017 with at least two outpatient follow-ups. Most patients needed proton pump inhibitor or H₂ receptor blocker, pancreatic enzyme supplement.

Results

This retrospective study of conducted on prospective data of 106 patients of Frey’s procedure from January 2000 to December 2017. The patients presented between the ages of 16-67 yrs, revealed 51 patients (48.11%) were in 3rd decade of life, 29 patients (27.35%) between 21-30 yrs age group and 9 patients (8.49%) between 41-50 yrs age group. There were 45 male and 61 female. This series shows a slight female predominance (57.54%). Females presented at an earlier age than the male patients (Figure 1 and 2).

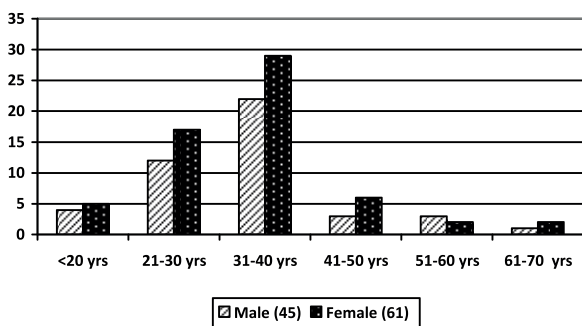


Figure 1. Age distribution of patients n=106

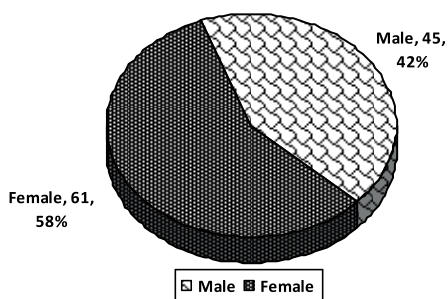


Figure 2. Sex distribution of patient's n=106

In our series, we found 77 patients presented with prolong diabetes mellitus, mostly on insulin as our hospital is a tertiary care hospital mostly dealing with diabetic patients. Steatorrhoea was noted in 39 patients and Malnutrition in 79 patients (Figure 3).

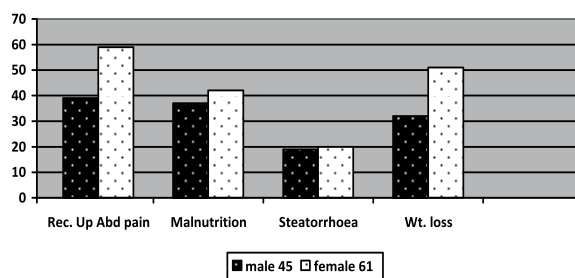


Figure 3. Presenting features of in 138 male and 184 female patients (n= 322)

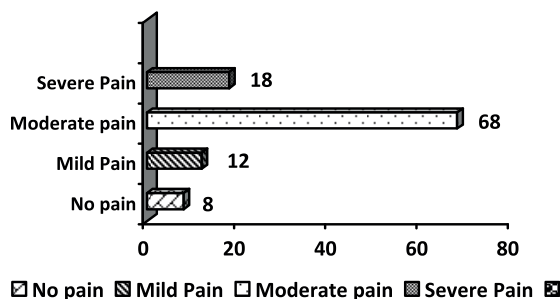


Figure 5. Visual Analog Scale (VAS) for Preoperative assessment of severity of pain

Recurrent abdominal pain of varying intensity was the predominant presenting complaint in almost all patients of CP in our study except 08 patients who presented with malnutrition weight loss and steatorrhoea. Among 106 patients of chronic severe pancreatitis 98 patients presented with recurrent abdominal pain. All patients were briefed about VAS to assess severity of pain, accordingly labeled as mild, moderate and severe pain. About pain 68 (64.15%) with moderate pain not responded to conventional analgesics. About 18 patients (16.98%) presented with severe or intolerable pain not responded to any analgesics (figure: 5).

Table I. Preoperative evaluation

Investigation	Number of patients
Plain X- ray of abdomen (A-P & lateral views)	All patients(100%)
USG of HBP system	
Glycemic status	
Liver & Renal function tests	
MRCP	78 (73.58%)
ERCP	49 (46.22%)
CT Scan	53 (50%)
Tumor marker (CA-19.9)	19 (17.92%)

Plain x-ray of abdomen and US scan of abdomen was the key investigations for diagnosis and to evaluate pancreatic stones and MPD. Although MRCP was invaluable to delineate stone(s), stricture(s), MPD dilatation and parenchymal changes In 78 patients (73.58%); but in 53 patients (50%) CT scan was also irreplaceable for planning Frey’s procedure. Moreover tumor marker CA 19.9 was done in 19 suspected cases (17.92%) with new or severe symptoms or with associated mass lesion. ERCP was performed in 49 patients (46.22%) (Table I). Among the 23 (21.69%) had multiple attempts of endoscopic stone extraction and 11 patients (10.37%) developed post-ERCP acute pancreatitis. They were treated conservatively and prepared for elective surgery after 4 to 6 weeks or till resolution of symptoms.

In this study, 106 cases of Frey’s procedure, revision surgery required for remnant stone in 3 cases of our initial experience (Table II). Three patient underwent hepatico-jejunostomy, in 01 patient for CP associated lower CBD stricture where Whipple’s Partial Pancreaticoduodenectomy was not possible due to severe adhesion, in 02 patients due to bile duct injury during head coring. Posterior Gastrojejunostomy was done for minor intraoperative duodenal injury In 03 patients. Other additional surgical procedures due to the associated conditions, eg. Cholelithiasis or GB sludge, choledocholithiasis, small peripancreatic abscess were also performed (Table III).

Table II. Additional surgical procedures n= 60 (56.60%):

Name of operation	No. of patients	%
Cholecystectomy	16	15.09%
Choledocholithotomy with T- tube	02	1.88%
Hepatico jejunostomy	03	2.83%
Peripancreatic abscess drainage	05	4.71%
Coeliac ganglion block for intractable pain	37	34.90%
Gastrojejunostomy	03	2.83%
Revision surgery	03	2.83%

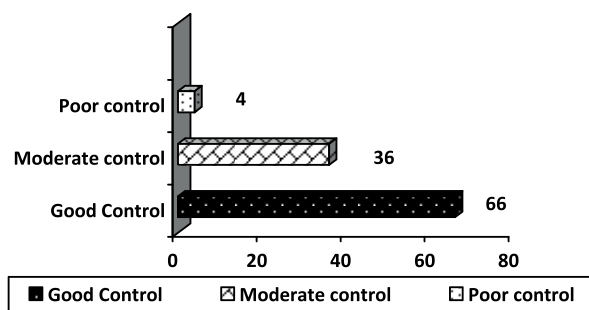


Figure 6. Postoperative assessment of Pain control using Visual Analog Scale (VAS)

Postoperative pain control was a major challenge. In our series we found that good pain relief was achieved in 66 cases (62.26%) and 36 patients (33.96%) with moderate pain control during immediate postoperative period. However, 04 (3.77%) patients were complaining of poor pain relief even after surgery (Table 7).

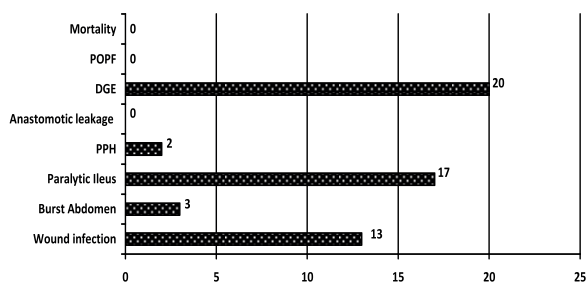


Figure 7. Post-operative complications

Postoperative morbidity was noted in 29 patients 27.35 % cases, but there was no anastomotic leakage, Postoperative Pancreatic Fistula (POPF) and immediate postoperative mortality or in 30 days in our series. Delayed Gastric Emptying (DGE) noted in 27 patients. Two patients had Post pancreatectomy Hemorrhage (PPH) and required exploration to control hemorrhage. Among them 13 patients had wound infection required wound care, 03 had burst abdomen that required immediate repair with tension suture. Two patients had internal hemorrhage presented with severe anemia, melena and hematemesis postoperative day 7th and 3rd. They were treated conservatively with blood transfusion, somatostatin analogue (Octreotide) but required Laparotomy and hemostatic suture. Among other complications, we found 12 (11.32%) patients with basal atelectasis, 11 (10.37%) with respiratory infections

and one was MRSA positive and treated accordingly. Seventeen patients (16.03%) developed paralytic ileus as they were with uncontrolled glyceamic status for prolong period and requiring high doses of Insulin and was treated accordingly (Figure 7).

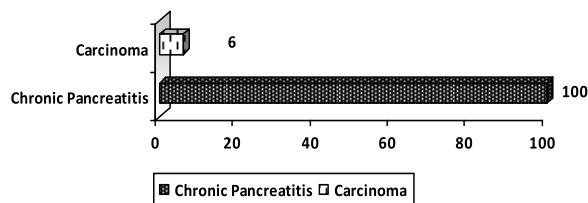


Figure 8. Histopathological study

Multiple samples of pancreatic tissues obtained in Frey's procedure, were sent for histopathological study to exclude malignancy. The study also revealed, 6 cases (5.66%) were diagnosed as adenocarcinomas and were treated accordingly. The rest of the 100 patients (94.33%) were with chronic pancreatitis (Figure 8).

Discussion

Chronic pancreatitis is a progressive, recurring inflammatory disorder characterized by irreversible destruction of pancreatic parenchyma and may be associated with disabling chronic pain and permanent loss of exocrine and endocrine function. Duodenum preserving pancreatic head resection (DPPHR) is the cornerstone treatment in head dominant disease. Frey's Procedure is the widely performed organ preserving procedure in which pancreatic head coring, clearance of MPD and drainage by lateral pancreatico-jejunosotomy. Incidence of CP is increased in fourfold in past 30 years and ranges 3-10 per 100,000 around the world. Pancreatolithiasis incidence is less than 1% and common in females. In 90% cases it is associated with pancreatic stones.^{5, 8} It is endemic to tropical countries about 20–125/100,000 persons in South India⁴. Chronic pancreatitis carries a mortality 3.6 times higher than individuals without pancreatitis, overall survival rate is 70% at 10 years and 45% at 20 years.¹³ Our series patients were randomly selected between the ages of 16-67 yrs, revealed 51 patients (48.11%) were in 3rd decade of life, 29 patients (27.35%) between 21-30 yrs age group and 9 patients (8.49%) between 41-50 yrs age group. There were 45 male and 61 female. This

series shows a slight female predominance (57.54%) presented earlier than male patients (Fig: 1 & 2).

Pancreatic pain is usually constant, severe and dull aching in mid-epigastrium often radiates to back, occurs in 80%-90% individuals.¹² The quality of life is worsened by pain and disease-related complications. Both pancreatic neuritis and pancreatic neuropathy are related with the inflammatory process.¹² Pain is due to stones or stricture in MPD, resulting in increased intraductal and interstitial pressures. VAS was used to assess the severity of pain, a valid tool of assessment at one point of time as primary or secondary outcomes.¹⁷ Pancreatic head is considered as "Pacemaker of pain". In our series all had recurrent abdominal pain except 08 patients who presented with malnutrition, weight loss and steatorrhea. About 68 patients (64.15%) with moderate pain and 18 patients (16.98%) presented with severe or intolerable pain according to VAS (figure: 5). Steatorrhea reported to be due to dietary fat intolerance with fat intake more than 100 gm/day²⁰. In our series, Steatorrhea was noted in 39 patients (36.79%) and malnutrition in 79 patients (74.52%) (Figure 3). Malabsorption responded to pancreatic enzyme supplementation.^{24, 25}

Pancreatic pathology with calcification leading to diabetes was first published more than 200 years ago by Cawley. Diabetes signifies advanced disease with considerable pancreatic endocrine damage, occurs in 50–70% of CP and 60–70% of calcific pancreatitis¹³. World Health Organization (WHO) categorized this as malnutrition-related diabetes mellitus.¹⁵ We found 77 patients presented with prolong diabetes mellitus, mostly on insulin as our hospital is a tertiary care hospital for diabetic patients.²³ Uncontrolled glyceamic status, recurrent pancreatitis are common. Ketosis resistance is due to defect in ketone body synthesis and/or regulation of counterbalancing hormones.⁷ They need Insulin in gradual dose adjustment or pump.^{14, 15}

Pancreatolithiasis etiology remains unclear, but malnutrition, dietary cyanogen toxicity, antioxidant deficiency and genetic predisposition are important predisposing factors. Pancreatic juice is saturated with calcium, kept in solution by HCO₃, citrate and pancreatic stone protein (PSP). Alcohol and chronic pancreatitis decreases PSP secretion, causes crystallization and deposition of calcium carbonate

(CaCO₃) to form stones.²⁴ Besides, MPD stricture(s) cause stagnation of pancreatic juice and propagates stone formation. Hypercalcemia may also contribute. Radio opaque shadow in plain X-ray locates pancreatic stones. US of abdomen to evaluate stones, MPD and parenchymal changes. ERCP was performed in 49 patients (46.22%) (Table: 1). Initially, ERCP was a diagnostic tool but precipitates pancreatitis by holding up dye in-between stones and strictured segment. Among them 23 (21.69%) experienced multiple attempts and 11 patients (10.37%) developed post-ERCP pancreatitis. However, ERCP has got the therapeutic role in cases with single stricture and small stones. We found, MRCP was invaluable to delineate stone(s), stricture (s), MPD dilatation and parenchymal changes in 78 patients (73.58%); CT scan was irreplaceable in 53 patients (50%) for planning Frey's procedure. Nutritional correction, control of glycemic status and control of other co-morbidities were key in preoperative preparation. Pancreatic stones can be managed by ERCP, extracorporeal shock wave lithotripsy (ESWL), surgery and denervation²⁴. ESWL to fragment large pancreatic calculi then endoscopic clearance of MPD by sphincterotomy and basket swiping for stone removal. Various endoscopic series reported 50–70% successful MPD clearance and 60–80% long-term pain relief with 10% complications rate. The data comparing endoscopic management with surgery is unconvincing. Prospective randomized control trial revealed surgery is superior to endotherapy¹⁹.

Surgical decompression is a time-honored treatment for long-term pain relief, extensive stones, MPD stricture-dilatation, mass lesion, associated complications and failure to medical and endoscopic treatment.^{10,18} Three important arrays were ductal decompression, denervation and pancreatic resection (proximal, distal or total pancreas). The choice of surgery is determined by the extent of disease.¹¹ Failure of Partington-Rochelle procedure is the absence of adequate decompression of proximal MPD, uncinata process and second generation ducts¹². In 1987, Frey and Smith described anterior resection of pancreatic head combining MPD drainage with longitudinal pancreaticojejunostomy. To reduce the risk of entering posterior capsule of head, Frey and Amikura later recommended posterior limit of resection and modified by limiting the pancreatic head coring anterior to MPD.^{6,7} Both original and modified Frey's

procedure are safe, but former yields better pain relief.¹¹ The Duodenum-preserving pancreatic head resection (DPHR) was proposed by Beger.²⁰ Duodenal ischemia, two pancreaticojejunal anastomoses, Postoperative Pancreatic Fistula (POPF, 25%), Delayed gastric emptying (DGE), ileus are major complications in Beger's procedure (25%).¹² Outcome of Partial pancreaticoduodenectomy is equivalent to Frey or Beger's procedure with mortality rate zero.

In our series of 106 Frey's procedure, revision surgery required for remnant stone in 3 cases and in 3 patients hepatico-jejunostomy was done, lower CBD stricture in 01 patient and in 02 patients due to bile duct injury during head coring. In 03 patients posterior Gastrojejunostomy was done for minor intraoperative duodenal injury. Postoperative morbidity was noted in 29 patients 27.35 % cases, but there was no anastomotic leakage, POPF and immediate postoperative mortality or in 30 days in our series. DGE was noted in 27 patients. Among them 13 patients had wound infection required wound care, 03 had burst abdomen that required tension suture. Two patients had internal hemorrhage presented with severe anemia, melena and hematemesis postoperative day 7th and 3rd. They were treated with blood transfusion, somatostatin analogue (Octreotide) but required Laparotomy and hemostatic suture.

Pancreatic malignancy is the dreadful sequel of CP with risk of progression to pancreatic adenocarcinoma 1.8% after 10 years and 4% after 20 years.²⁶ It often creates a diagnostic dilemma with therapeutic uncertainty.²⁶ Although these are commonly chronic inflammatory fibrotic lesions but in 4% cases associated with pancreatic malignancy and 18% cases in endemic zone. Patients with TP have a high risk of pancreatic cancer. The risk of developing pancreatic cancer is less in CP. The Risk is higher in hereditary pancreatitis (HP). High index of suspicion with recent weight loss, back pain or jaundice.^{27,28} Multiple samples obtained in Frey's procedure were sent for histopathological study to exclude malignancy. The study also revealed, 6 cases (5.66%) Incidence of carcinoma in our series and were treated accordingly. However, 100 patients (94.33%) were with chronic pancreatitis (Figure 8).

Pain is a decisive factor that hampers quality of life. We found, 98 patients presented with recurrent abdominal pain with moderate pain in 68 patients

(64.15%) and severe or intolerable pain in 18 patients (16.98%). Postoperative pain control was a major challenge. However, moderate pain control in 36 patients (33.96%). Literature review revealed 70-80% pain relief after Frey procedure with improved quality of life.^{29,33,34} In our series, it was with successful outcome in 96.22 % cases with good pain relief in 66 cases (62.26%) and only 04 (3.77%) patients were complaining of poor pain relief.

Conclusion

Pancreatic head coring is an organ-preserving procedure with minimal mortality and morbidity. We found, Surgery is the most effective strategy despite medical and endoscopic management. Control of postoperative pain, diabetes, malnutrition and steatorrhea is sometimes challenging. We recommend pancreatic head coring surgery as a key procedure in treatment of head dominant chronic pancreatitis, offers better pain control with improved quality of life.

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Conflict of interest: Nothing to declare.

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