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Original Research Article

Large pseudocyst of pancreas: open surgical drainage by Roux-en-Y cystojejunostomy-an effective physiological drainage strategy: an experience of 28 cases over 18 years

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ABSTRACT

Background: Pseudocyst pancreas is a complication of acute or chronic pancreatitis. Most pseudocyst <06 cm resolve on their own but large pseudocyst may pose a problem if untreated. Diagnosis is accomplished by USG whole abdomen and CECT whole abdomen. There are different therapeutic strategies: such as endoscopic drainage, percutaneous pigtail external drainage and open surgical internal drainage by Roux-En-Y cystojejunostomy.
Methods: This study is the original research prospective study and the cases were prospectively studied in different military hospitals where the lead author served as an army surgeon dealing with 28 cases over 18 years (2006-2024). Over a period of 18 years, we evaluated the result of Roux-en-Y cystojejunostomy in 28 patients diagnosed with pancreatic pseudocysts. They all were >06 to 08 weeks old, >10 cm in diameter (>10 cm is termed as large), situated in the body and tail of the pancreas, with 0.7 to 0.8 cm wall thickness. They all were subjected to standard open surgical drainage (OSD) by Roux-en-Y cystojejunostomy and prophylactic cholecystectomy. Ethical clearance was taken from SGT University gurgaon for cases that were done from 2017 onwards till 2024.
Results: Out of 28 patients of pseudocyst pancreas, 06 had SSI, 02 elderly patient with diabetes mellitus had slow recovery. Early enteral feeding within 04 days could be resumed in 11 patients and one had pelvic collection, which was managed by USG guided aspiration. Average hospital stay was 12 days. No morbidity or mortality.
Conclusions: We therefore conclude that pancreatic large pseudocyst can be drained effectively and physiologically by open surgical Roux-En-Y cystojejunostomy in any secondary health care center managed by general surgeons.

Keywords: Pseudocyst, Surgical drainage, Pancreatitis, Roux-en-Y, Cystojejunostomy, Cytogastrostomy

INTRODUCTION

Pancreatic pseudocysts are localized accumulations of pancreatic fluid that develop within or adjacent to the pancreas. These formations are enclosed by a distinct wall composed of fibrous and granulation tissue, lacking an epithelial lining, which differentiates them from true cysts. The fluid contained within these pseudocysts is typically rich in pancreatic enzymes, notably amylase. They most commonly arise as a complication following acute pancreatitis but can also result from chronic pancreatitis, surgical procedures involving the pancreas, or traumatic injury to the pancreatic region.[1]

In the Indian population, gallstones are responsible for around 80% of pancreatitis cases, while about 10% are linked to excessive intake of alcohol and fatty foods. In contrast, Western literature suggests that gallstones account for 50-70% of cases and alcohol for approximately 25%.

Pancreatic pseudocysts typically take about 2 to 6 weeks to mature, during which about one-third may resolve on their own. However, many persistent pseudocysts require medical intervention due to risks such as infection, bleeding, or rupture.

Pseudocysts can also exert pressure on nearby hollow organs like the stomach, duodenum, and transverse colon, potentially leading to partial or complete blockages. This can manifest as conditions such as gastric outlet obstruction (GOO), duodenal outlet obstruction (DOO), splenic vein thrombosis, or even erosion of nearby arteries like the splenic and gastroduodenal arteries, possibly resulting in pseudoaneurysm formation.[2-5]

In rare cases, a pseudocyst may spontaneously form a connection (fistula) with the stomach, duodenum, colon, or small intestine-a phenomenon known as spontaneous pancreatic pseudocystoenterostomy. Pseudocysts may be symptom-free or cause a range of issues including abdominal pain, early fullness, upper GI bleeding, nausea, and vomiting. Diagnostic imaging typically involves a whole abdominal ultrasound and contrast-enhanced CT (CECT) scan.

Several treatment options exist for managing pancreatic pseudocysts, including conservative (watchful waiting), endoscopic drainage, percutaneous external drainage using a pigtail catheter, laparoscopic drainage, and OSD. While many pancreatic pseudocysts resolve spontaneously, certain characteristics can reduce the likelihood of natural resolution. Specifically, pseudocysts that are larger than 6 cm in diameter, possess a thickened wall, persist beyond 12 weeks, or are associated with chronic pancreatitis have a diminished chance of resolving without intervention. These features are often considered indicators for potential complications and may necessitate clinical management. Intervention is usually recommended when the pseudocyst causes symptoms, complications arise, or it persists beyond the typical resolution period, necessitating surgical treatment.

Indications for therapeutic intervention of pancreatic pseudocysts.[6] Complicated pancreatic pseudocysts such as having pressure effect or fistulation into adjuvant hollow organ, cyst infection and intra cystic bleed.

Symptomatic pancreatic pseudocyst

It was pain and early satiety.

Asymptomatic pancreatic pseudocyst

Pseudocysts diameter >05 cm, unchanged in size and morphology for more than 06 weeks.[7] Diameter >04 cm and extra pancreatic complications in patients with chronic alcoholic pancreatitis.[8] Suspected malignancy as seen in long standing pseudocyst with positive tumour marker (CA19-9) and CEA: 05-year survival rate after resection is 56%.[9]

Percutaneous external drainage under radiological guidance is generally discouraged due to a high risk of recurrence and the potential development of a persistent pancreatic pseudo-cysto-cutaneous fistula. It is especially inadvisable when there is uncertainty or suspicion about the cyst being neoplastic in nature.

Endoscopic drainage has become the preferred initial treatment for pancreatic pseudocysts due to its minimally invasive nature, avoidance of external drains, and high long-term success rates. This procedure can be performed via two primary approaches.

The trans papillary approach utilizes endoscopic retrograde cholangiopancreatography (ERCP) and is typically employed when the pseudocyst communicates with the main pancreatic duct, often at the duct's bend. It is also effective in cases involving pancreatic duct disruption. Alternatively, the trans gastric or trans duodenal approach is used when the pseudocyst is adjacent to the stomach or duodenum. Endoscopic ultrasound (EUS) is the preferred tool for assessing the pseudocyst's size, location, and wall thickness before drainage. However, if the cyst lies more than 1 cm away from the stomach or duodenal wall, or if large blood vessels or varices are present, endoscopic drainage may not be advisable.[10,11]

For uncomplicated, mature pancreatic pseudocysts, internal drainage is the treatment of choice. Pseudo cysto-gastrostomy is performed when the cyst is closely attached to the posterior wall of the stomach. Pseudo cysto-jejunostomy is appropriate for all other locations, including very large cysts exceeding 15 cm in diameter.[12,13]

Pseudo cysto-gastrostomy is often considered easier, faster, and less prone to infection, and it can typically be performed by general surgeons with limited experience. Pseudo cysto-jejunostomy appears to be more commonly used and may yield slightly better outcomes than pseudocystogastrostomy.[13] One possible reason for the favorable outcomes seen with pseudo cysto-jejunostomy is that the cyst fluid and pancreatic juice-both alkaline-are drained into the alkaline environment of the jejunum, preserving a physiologically appropriate pathway.

In a retrospective analysis conducted by Adams and Anderson, the outcomes of 94 patients with symptomatic pancreatic pseudocysts were compared between two treatment modalities: internal surgical drainage (42 patients) and percutaneous catheter drainage (52 patients). The incidence of major complications was observed to be 16.7% in the surgical group and 7.7% in the percutaneous group; however, this difference did not reach statistical significance ($p>0.05$). Reoperation was necessary in 9.5% of cases in the surgical cohort compared to 19.2% in the percutaneous group, which also was not statistically significant ($p>0.05$). Notably, the mortality rate was significantly higher in the surgical

group at 9%, whereas the percutaneous group experienced a mortality rate of 1% ($p<0.05$).[14]

Jedlicka was the first to perform a pseudo cysto-gastrostomy in 1921.[15] Surgical drainage as the preferred treatment for symptomatic pancreatic pseudocysts. Procedures like cysto-gastrostomy and cysto-jejunostomy offer long-term resolution rates of 91-97%, with reported morbidity between 10-30% and mortality ranging from 0-13%.[16] Among these, Roux-en-Y cystojejunostomy is considered a more physiologically appropriate method compared to pseudocystogastrostomy or external pigtail drainage, as previously described.

Objective

Objective was to observe prospectively the result of OSD by Roux-En-Y cysto-jejunostomy, in respect of surgical complications, hospital stay, morbidity and mortality.

METHODS

Over a period of 18 years, we performed 28 OSD of pancreatic pseudocyst by Roux-en-Y cysto-jejunostomy. All of them had a history of pseudocyst > 06 to 08 weeks old, size of >10 cm diameter, situated in the body and tail of the pancreas, with 0.7 to 0.8 cm wall thickness as detected by USG or CT. This is a progressive prospective study over 18 years where sample size grew with the passing period of study till 2024. They all were subjected to standard OSD by Roux-en-Y cysto-jejunostomy, after taking biopsy of cyst wall. All of them underwent mandatory prophylactic cholecystectomy, and the gall bladder specimen without fail were sent for HPE (histopathological examination)-firmly believing the dictum "a good surgeon sends everything for biopsy except nails and hairs of his patient- since nails and hairs do not suffer from tuberculosis and malignancy-the two diseases surgeons dread the most"! -(Dr. Vinayak Nagesh Shrikhande-1986 Mumbai).

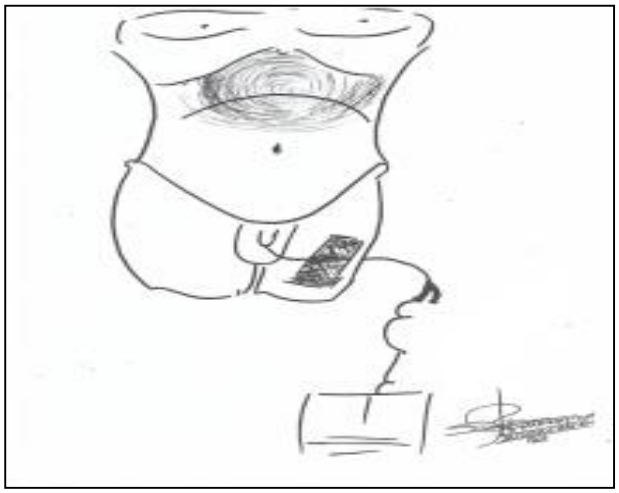

Figure 1: Pseudocyst presenting as upper abdominal lump.

Figure 2: Pseudocyst presented on CT scan compressing surrounding structures.

Preoperative clinical evaluation and routine lab tests, blood group, X-ray chest, ECG and tumor markers were done (CA 19-9, CEA and AFP). Patient was checked for hepatotropic viral markers (HBsAg, HCV) and HIV. Preoperative Ultrasonography of whole abdomen and computed tomography whole abdomen were performed to evaluate the size and location of the pseudocyst, wall thickness and its relation to the surrounding structures. Post operatively patient were managed accordingly.

Operative technique: Roux-en-Y pancreatic pseudocystojejunostomy

Under ET-GA (Endotracheal general anaesthesia), the abdomen was opened with a truncated "roof-top" incision (Chevron/Bilateral subcostal) (as shown in Figure 1), extending the longer limb of chevron to right. We have been routenly dividing rectus abdominis muscle (Right) by our "London bridge technique" to ensure deliberate electrocoagulation of the divided muscle, to avoid post-operative bleeding from the cut muscles leading to hematoma formation.

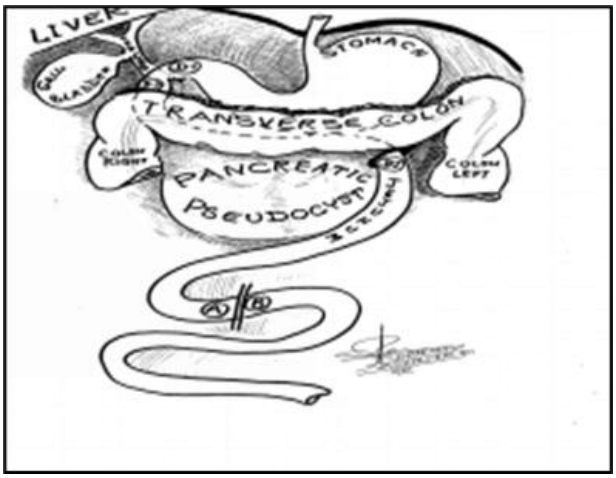

Figure 3: Diagrammatic representation of pseudocyst.

Figure 4: Aspiration confirmation test of pseudocyst.

Figure 5: Evacuation of dead and necrotic pancreatic tissue, clots and casts.

The pancreas was identified and the cyst was located. The cyst was approached in the infracolic compartment, to the left of middle colic vessels, through the avascular space of Riolan. In the prominent and most fluctuant part of the cyst, aspiration confirmation was done with 10 ml syringe using 18G needle. The aspirate was sent for bacterial, biochemical (amylase and lipase) and cytologic examination. Cyst was opened at the most fluctuant point with the help of electrocautery coagulation mode. The cyst cavity was wiped clean and cyst fluid was sent for amylase level estimation, culture and cytology. The jejunum was then traced and identified by ligament of treitz which marks DJ (Duodeno Jejunal) junction. The jejunum was then divided about 15 to 20 cm distal to DJ and the open lumen of both proximal and distal ends were suture closed in two layers (using 03/0 Vicryl for inner layer and 03/0 ck silk Seromuscular suture as outer layer) (Figure 7).

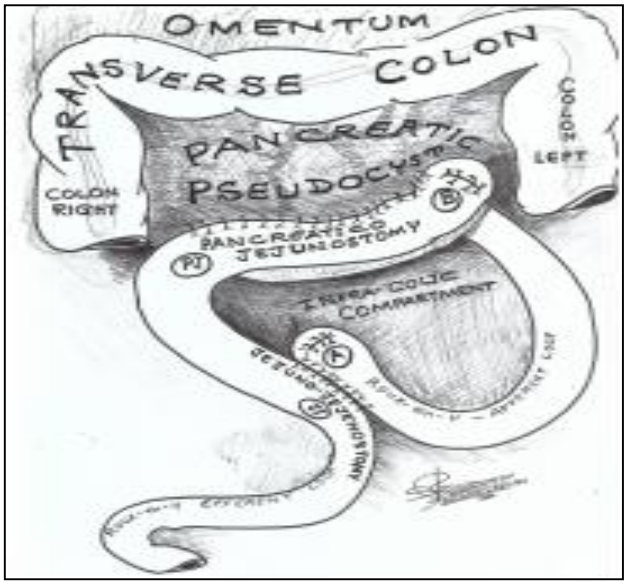

Figure 6: Roux-En-Y cystojejunostomy diagramatic view.

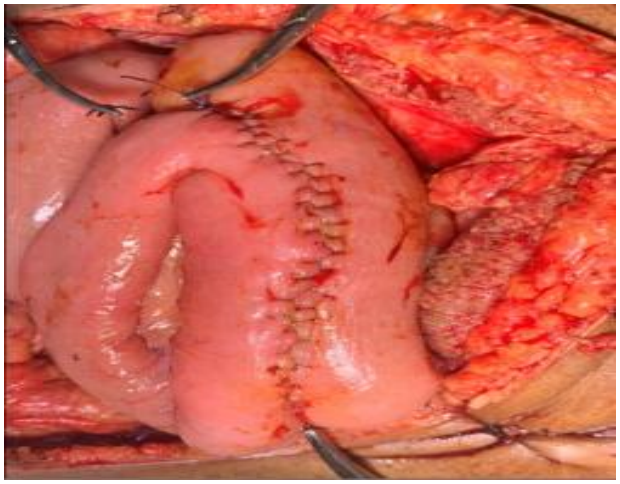

Figure 7: Side to side jejuno-jejonostomy-completion of "Roux-en-Y" technique.

Next the distal end of jejunum was anastomosed with the pseudocyst cavity (maintaining an anastomotic annulus of about 05 to 06 cm) and closed in 4 layers [outer seromuscular layer (layer 01 and 04) with 03/0 black silk on round body needle and inner layer (layer 02) by 03/0 vicryl in interlocking suture and the remaining inner layer (layer 03) by Schmieden's inverting suture. Roux-en-Y was completed by anastomosing the proximal end of jejunum to the distal portion of the jejunum, about 45 cm "downstream" to pseudocystojejunostomy, as a side to side anastomosis (in 04 layers as described above, creating an anastomotic ring of 05 to 07 cm).

Two 32 F abdominal drains were placed-one in the infracolic area below the pseudocysto jejunostomy and the other in the pelvis. The drains were anchored to the skin "kink-free" by our usual method "Roman sandal pattern" of drain fixation using 01/0 black silk suture on

reverse cutting needle. Abdomen was closed en-masse using PDS loop 01/0. In all our cases subcutaneous space was prophylactically drained with multiperforated by bone nibbler technique 32F abdominal drain anchored to skin. Skin was closed with 03/0 ethilon curved cutting needle, as vertical mattress sutures.

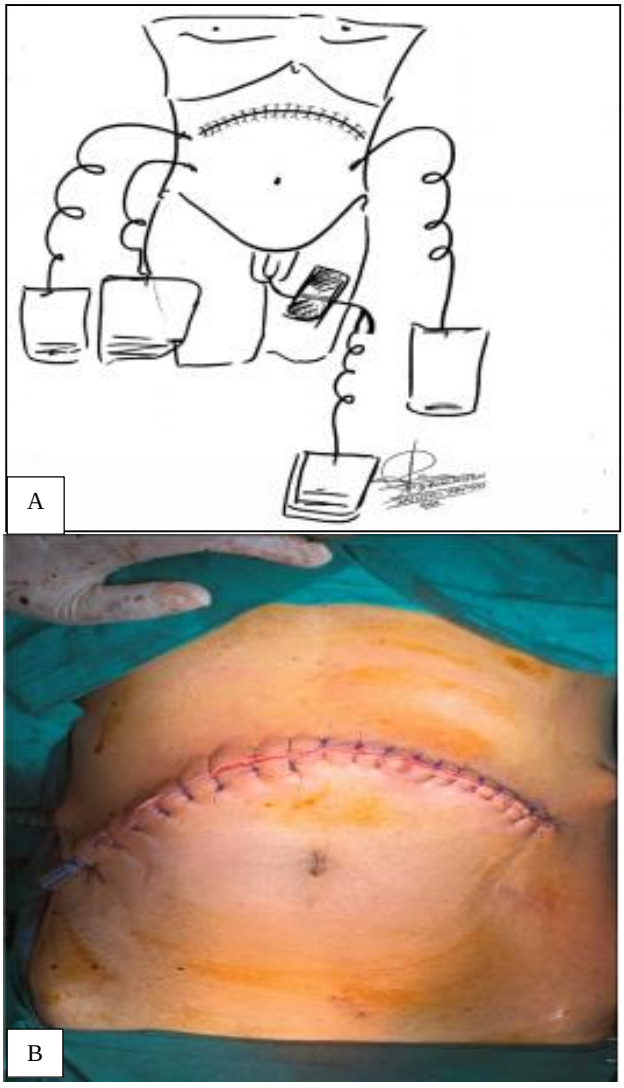

Figure 8 (A and B): Abdominal and diagrammatic sketch of the abdomen with drains (left and right-subcutaneous, subhepatic and pelvic drains) and wound closed, end of surgical procedure.

RESULTS

Out of 28 patients of pseudocyst pancreas, 23 developed pseudocysts due to gall stone pancreatitis, 02 due to alcoholic binging, 02 due to trauma and 01 presumed to be of Idiopathic nature.

The most common indication for surgical intervention was symptomatic pseudocysts (early satiety, vomiting, pain) and less commonly due to complication of pseudocyst pancreas (GOO/DOO, compression of bile duct, haemorrhage and infected cyst).

Table 1: Etiology, clinical characteristics, and postop period complications of pseudocyst pancreas.

Variables	N (%)
Etiology	
Gall stone induced	23 (82)
Alcohol induced	02 (7)
Traumatic	02 (7)
Idiopathic	01 (4)
Clinical characteristics	
Sex (M:F)	12:16
Age (mean)	40
Mean size (cm)	13
Operative time (min)	180
Postop period complications	
Pain (excessive)	04
Surgical site infection	06
Slow recovery	02
Pelvic collection	01

Out of 28 patients, 06 patients had surgical site infection 02 elderly patients who had history of diabetes mellitus, had slow recovery with long hospital stay. Early enteral feeding within 04 days could be resumed in 11 patients with no complication such as nausea or vomiting. One had pelvic collection which was serosanguinous in nature, managed by USG guided aspiration. An average hospital stay for patients was 12 days. There were no long-lasting morbidity and no mortality in our study.

DISCUSSION

Pancreatic pseudocysts are encapsulated accumulations of pancreatic fluid that lack an epithelial lining, distinguishing them from true cysts. They often arise as complications of pancreatitis, with a higher incidence observed in chronic pancreatitis, particularly cases associated with gallstone disease. In our study, gallstone-induced pancreatitis was identified as the predominant cause of pseudocyst formation. Common clinical manifestations included abdominal pain, early satiety, and vomiting. The anatomical position of the pseudocyst significantly influences both symptomatology and the selection of an appropriate management approach. Treatment strategies are generally categorized into observation and intervention, with critical factors such as the pseudocyst's size, location, and maturity guiding decision-making. Historically, pseudocysts exceeding 6 cm in diameter and persisting beyond 6 weeks were considered unlikely to resolve spontaneously, often necessitating surgical drainage.

One of the most challenging aspects in managing pancreatic pseudocysts is determining which cysts necessitate drainage and which can be safely monitored. Key considerations include the appropriate timing of intervention, the size threshold for drainage, and identifying cysts that are either inaccessible or likely to cause serious complications. Another important technical

factor is the maturity of the cyst wall, as mature walls can securely hold sutures. A widely used heuristic in surgical practice-though not formally published as a guideline-is Bradley's rule of six (attributed to Dr. Edward L. Bradley III), which suggests that a pseudocyst larger than 6 cm, older than 6 weeks, and with a wall thickness of over 6 mm is unlikely to resolve on its own and is suitable for OSD via Roux-en-Y cystojejunostomy.[16]

Surgical drainage is typically achieved through one of three types of internal anastomosis: cystogastrostomy, cystoduodenostomy, or cystojejunostomy. The primary deciding factors are the anatomical characteristics of the pseudocyst, with the surgeon's experience and preference being secondary considerations.

Cystoduodenostomy is selected when the pseudocyst is located in the pancreatic head and is firmly attached to the duodenum. However, this approach is contraindicated if there is a thick rim of pancreatic tissue between the pseudocyst and duodenum. Safety concerns have been raised due to the latero-lateral nature of the anastomosis, especially when the pseudocyst is not tightly fused to the duodenal wall or lies near critical structures like the terminal bile duct and pancreatic duct. This method is considered technically demanding, with comparatively higher risks of morbidity and mortality.[16,17]

Cystogastrostomy is employed when the pseudo-cyst lies in the epigastric region and is adherent to the posterior wall of the stomach, which is a prerequisite for this procedure. The benefit of this method is that it allows direct drainage into the stomach. However, it carries an increased risk of infection due to pooling of gastric and pancreatic secretions, which may lead to abscess or sepsis. Additionally, it has a higher likelihood of postoperative hemorrhage compared to cystojejunostomy.[17]

Logically cystojejunostomy is preferred for very large pseudocysts that extend into the umbilical, hypochondriac, or lumbar regions. It facilitates dependent drainage and is generally the anastomosis of choice for giant pseudocysts. Furthermore, it represents the most physiological drainage route, as pancreatic juice-a naturally alkaline fluid-empties into the similarly alkaline environment of the jejunum.

Based on our study findings, surgical management with Roux-en-Y cystojejunostomy proved to be both effective and safe for treating large, symptomatic pancreatic pseudocysts. which would have been technically inadequate and or impossible by other method of internal drainage such as pseudo-cystogastrostomy and pseudo cystoduodenostomy.

CONCLUSION

We therefore conclude that large pancreatic pseudocyst can be drained effectively and physiologically by open surgical Roux-en-Y cystojejunostomy method in any secondary health care centre, manned by general surgeons with some GI-surgical exposure and experience. Moreover, OSD provides an easy access for biopsy of cyst wall and prophylactic cholecystectomy (to neutralise the future trigger for pancreatitis), which may be denied in pigtail and endoscopic drainage. Although OSD has more pain, larger surgical scar and longer hospital stay as compared with other mentioned methods, but it remains the ultimate method for drainage of large pseudocyst pancreas with provision to collect sample biopsy of cyst wall (fearing mitotic lesion of pancreas), evacuation of thick "pancreatic muck, debris and pancreatic cast" thereby reducing the infective load on the host (patient) and for neutralizing the pancreatitis trigger by gall stones by executing cholecystectomy in the same sitting.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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