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Endosonographic imaging of pancreatic pseudocysts before endoscopic transmural drainage

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Background: Endoscopic drainage of pancreatic pseudocysts has become an established alternative to surgery. We performed endosonography before endoscopic drainage to find out whether detailed anatomic information would help in the selection of appropriate candidates and result in a reduction of complications.

Patients and Methods: Between April 1992 and July 1995 endosonography was performed in 32 patients, referred for endoscopic pseudocyst drainage, to determine the minimal distance between the pseudocyst and the gut, to identify interposed vascular structures, and to determine the optimal site for drainage.

Results: Endosonography failed to identify a pseudocyst in 3 patients and in 2 patients the lesion was inconsistent with a pseudocyst. In 7 patients transmural drainage was considered inappropriate: in 4 the distance between the gut and the cyst was too large, in 2 varices were present between the cyst and the gut, and in 1 patient normal pancreatic parenchyma was present between the cyst and the gut. In 20 patients endosonography was followed by ERCP, and in 19 endoscopic drainage was attempted. Transmural drainage was successful in 16 patients. Endosonography changed management in 37.5% of the patients.

Conclusion: Endosonography provides essential information prior to endoscopic drainage of pseudocysts, leading to a change in therapy in one third of patients. (Gastrointest Endosc 1997;46:412-6.)
drained via the papilla of Vater and the pancreatic
duct.

Recent publications on endoscopic transmural and
transpapillary drainage have shown high technical
success rates and rather low long-term recurrence
rates of 10% to 20%. These results are satisfactory
and comparable to surgical results. Early complica-
tions of transmural drainage consist mainly of
bleeding or perforation of the stomach or duodenum.
Bleeding occurs when a submucosal vessel or vessel
between the wall of the gut and the pseudocyst is
accidentally punctured or transected and may re-
quire surgical intervention. Perforation of the
stomach or duodenum into the abdominal cavity or
retroperitoneum may occur when the distance be-
tween the pseudocyst and the gut wall is too large or
when a puncture is performed without sufficient
doscopic landmarks. Endosonography provides
high-resolution imaging of the gastrointestinal wall
and direct surroundings and could theoretically be
helpful in selecting those patients in whom endo-
sopic drainage is appropriate by (1) providing diag-
nostic information about the cyst and the pancreas
itself (Fig. 1), (2) assessing the distance between the
gut wall and the pseudocyst, and (3) identifying
vessels between the gut lumen and the pseudocyst.
This detailed information may prevent complica-
tions of the procedure. We undertook a prospective
study to evaluate the role of endosonography before
endoscopic drainage of a pancreatic pseudocyst. The
aim of the study was to determine whether en-
dosonography could identify suitable candidates for
endoscopic therapy and the impact of endosonogra-
phy on the management of these patients.

PATIENTS AND METHODS

Between April 1992 and July 1995, 32 patients were
referred for endosonography prior to endoscopic drainage
of a pancreatic pseudocyst. There were 17 men and 15
women, with a median age of 48 years (range 29 to 78).
The cysts had been detected by transabdominal ultra-
sonography or CT, which had been performed before the
patient was referred for endoscopic drainage. All patients
were referred because of size or symptoms of the pseudo-
cyst and were discussed in a medicosurgical conference
prior to attempted drainage. The cause of the pancreatitis
leading to the 32 pseudocysts was unknown in 15 patients,
alcohol related in 7, of biliary origin in 5, due to a trauma
in 1, drug related in 1, postpancreatic surgery in 1, due to
pancreas divisum in 1, and due to obstruction of the
pancreatic duct by an irresectable pancreatic head carci-
noma in 1 patient. Two patients were studied twice, 9
and 12 months after the initial successful endoscopic
treatment.

Endosonography was performed using a rotating sector
scanner (GF-UM20, Olympus Optical Co., Tokyo, Japan).

Patients were examined in the left lateral position after an
overnight fast. Topical pharyngeal anesthesia as well as
conscious sedation with midazolam (2.5 to 5 mg) was given
under continuous monitoring of pulse rate and oxygen
saturation. The echoendoscope was introduced blindly
into the stomach and then advanced under endoscopic
control through the pylorus into the duodenum. Visualiza-
tion of the pancreatic head and part of the body was first
attempted. Thereafter the echoendoscope was pulled back
into the stomach to visualize the rest of the body and the
tail of the pancreas. The cyst was visualized from the
duodenum or stomach or both and the minimal distance
between the cyst wall and the lumen of the gut was
measured. The endosonographically optimal location for
drainage was noted. This was the site in which the
pseudocyst and gut wall were closest together in absence
of interposed vessels. No attempts were made to mark the
optimal location. Finally, the presence of vessels in and
around the stomach or duodenum, and in particular be-
tween the cyst and the gut, was investigated. Transmural
drainage was not attempted when the distance between the
cyst wall and the lumen of the gut exceeded 1 cm or when vascular struc-
tures were seen between the gut and the cyst.

ERCP was performed after endosonography on the
same day, in most patients. Pancreatography was first
attempted and when the pseudocyst communicated with
the pancreatic duct, insertion of an endoprosthesis
through the papilla of Vater was attempted. If transpa-
pillary drainage could not be performed, the duodenum and
stomach were searched for an unequivocal impression
from the pseudocyst. If a clear bulging mass with
stretched mucosa was identified, a puncture with a dia-
thermic pre-cut needle was made in this bulge to gain
access to the cyst. After insertion of the pre-cut needle in
Table 1. Summary of the results of endosonography performed in 32 patients referred for endoscopic drainage of a pancreatic pseudocyst

<table>
<thead>
<tr>
<th>Results</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>All patients (n = 32, 100%)</td>
<td></td>
</tr>
<tr>
<td>No cyst seen during ES</td>
<td>5</td>
</tr>
<tr>
<td>Not suitable for endoscopic drainage</td>
<td>7</td>
</tr>
<tr>
<td>Drainage possible according to ES (n = 29, 63%)</td>
<td>3</td>
</tr>
<tr>
<td>Complications</td>
<td></td>
</tr>
<tr>
<td>No endoscopic landmark visible</td>
<td>1</td>
</tr>
<tr>
<td>Successful drainage (n = 16, 50%)</td>
<td></td>
</tr>
</tbody>
</table>

ES, Endosonography.

the cyst, the needle was removed from its catheter, fluid was aspirated for analysis, and contrast medium was injected through the catheter to confirm that the catheter was in a correct position in the cyst. A guidewire was then inserted; over the catheter plus guidewire, a straight Amsterdam-type, polyethylene, 10F endoprosthesis with multiple side holes was inserted into the cyst under fluoroscopic control.

RESULTS

Endosonography was performed without complications in all patients. Table 1 summarizes the results of the endosonography examination and the subsequent therapy for the pseudocyst. In five patients (16%) no clear pseudocyst could be identified endosonographically: in one patient a Billroth II gastrectomy was present prohibiting visualization of the cyst in the pancreatic head; in two patients the cyst had disappeared since the last transabdominal ultrasonography or CT; in one patient the expected cyst had a hyperechoic appearance compatible with a solid tumor; in another patient a large, poorly delineated area with fluid and hyperechoic particles was seen without a clear wall. The last two patients were both treated surgically. The patient with the suspected solid tumor on endosonography turned out to have an ordinary pseudocyst at surgical exploration, filled with clear fluid.

Of the 27 patients in whom a pseudocyst was visualized, 1 patient had two cysts (diameter 9.5 and 3 cm). Seven cysts were located in the pancreatic head, 9 in the pancreatic head and body, 3 in the body of the pancreas, 5 in the body and tail area, and 3 cysts were located in the pancreatic tail. The size of the cysts was too large to measure with endosonography in 2 patients. The other 25 cysts had a median diameter of 7 cm (range 2 to 10 cm) on endosonography. The minimal distance between the cyst and the gut lumen was not recorded in 1 patient. In the remaining 26 patients the median distance was 5 mm (range 1 to 10 mm). Varices or collaterals were seen in or around the proximal stomach in 6 patients (22%).

Endoscopic transmural drainage was not performed in 7 of the 27 patients (26%) in whom a pseudocyst was visualized with endosonography. In 4 patients the distance between the cyst and the gut lumen was 9 or 10 mm, which was considered excessively large compared to the relatively small size of the cysts (2 to 4 cm). In 2 patients varices were interposed between the gastric wall and the cyst, and in 1 patient with a pseudocyst in the head of the pancreas, a 5 mm rim of normal pancreatic tissue was visible between the cyst and the duodenal bulb. Transpapillary drainage of the cysts was attempted in 4 of these 7 patients and successful in 2.

In 20 patients of the total group of 32 patients (63%), endosonography was followed by ERCP with the intention to drain the pancreatic pseudocyst. In 1 patient no bulge could be found and transmural drainage was not attempted. During pancreatography in this patient no communication between cyst and pancreatic duct could be shown, making transpapillary drainage also impossible. This patient was treated surgically. Endosonography identified the duodenum as the optimal location for drainage in 3 patients. All 3 were successfully drained transduodenally without complications.

In 16 patients endosonography suggested the stomach as the optimal location for transmural drainage. Transgastric drainage was successful in 11 of these 16 patients. In 2 patients transgastric drainage failed because of the inability to find a good stable position of the side-viewing endoscope in the stomach to puncture the pseudocyst, but both patients were successfully drained transduodenally. In both patients the echoendoscope had not been inserted through the pylorus because the impression of the pseudocyst on the antrum prevented a complete investigation. In 3 patients transgastric drainage failed because of complications. In 1 patient, in whom the distance between the gastric wall and cyst was 8 mm, contrast leakage in the peritoneal cavity was seen after puncturing the gastric wall and no further drainage attempts were undertaken. The patient was kept under observation and was discharged 24 hours after the procedure. Slow spontaneous regression of the pseudocyst occurred without intervention. In 2 patients bleeding started during a superficial puncture in the stomach leading to termination of the procedure. No transfusions were necessary and both patients were discharged after 24-hour observation. Surgical marsupialisation was performed in both at a later occasion.
DISCUSSION

Endosonography in the present series of 32 patients referred for endoscopic pancreatic pseudocyst drainage had a major impact on further management. In 12 of the 32 patients (37.5%) endosonography provided complementary information to trans-abdominal ultrasonography and/or CT, which led us to abandon the intended endoscopic drainage. In 2 of 12 patients a pseudocyst could no longer be found. These had spontaneously resolved between the last investigation and the planned endoscopic treatment. This emphasizes the necessity of imaging the pseudocyst shortly before an attempted endoscopic drainage. In 7 of the 12 patients local factors, such as distance between the gut wall and the cyst and the presence of normal pancreatic tissue or vessels between the cyst and the gut lumen, were considered unfavorable for endoscopic drainage.

Although endosonography provides important information prior to endoscopic drainage of pancreatic pseudocysts, there are a number of drawbacks to the combination of endosonography and ERCP. The patient has to swallow two different endoscopes, the two techniques use a different medium to fill the gut (water vs air) with the risk of water aspiration after the first procedure and, most important, the puncture remains a blind procedure. Ideally, endoscopic marsupialization should be performed under direct endosonographic guidance. This would virtually rule out the possibility of missing the pancreatic pseudocyst with the needle and would probably also eliminate the risk of puncturing a vessel. An attempt to reach this ideal situation was reported by Grimm et al. by use of an electronic oblique scanning echoendoscope (FG-32UA, Pentax Precision Instruments, Tokyo, Japan). This technique entails an endosonographically guided puncture of the pseudocyst after which a guidewire is introduced under fluoroscopic control. The echoendoscope is then exchanged for a large-channel endoscope and a 10F endoprosthesis is inserted in the pseudocyst over the guidewire. The small-caliber instrumentation channel of the Pentax echoendoscope does not allow insertion of a large-caliber stent. The echoendoscope exchange is cumbersome and may result in loss of access to the pseudocyst due to guidewire displacement. In a series of nine patients this method was successful in all patients, two of whom had no endoscopic landmark. An echoendoscope with a large working channel is eagerly awaited to further simplify this procedure.

Another interesting single intubation technique was described by Savides et al. In patients in whom an impression of a pseudocyst could not be visualized endoscopically, a 6.2F ultrasound cathe-
that after selection of patients with transabdominal ultrasonography and/or CT, only half of the patients could be treated successfully. When patients were selected on the basis of endosonographic appearance the success rate increased to 80%. Greater success will probably only occur once endosonographically guided puncturing and drainage become feasible with the development of an echoendoscope with a large-caliber instrumentation channel.

REFERENCES