

# Minimally invasive pancreatic necrosectomy

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Published online in Wiley InterScience (www.bjs.co.uk). DOI: 10.1002/bjs.5723

It is timely, a decade after the first reports of minimally invasive necrosectomy (MIN), to review the progress of this procedure that now encompasses radiological, endoscopic and percutaneous techniques. The main impetus towards MIN has been the recognition that open necrosectomy often makes patients sicker and that outcome may be improved when necrosectomy is delayed<sup>1</sup>. The situation is also influenced by the recent recognition that almost all patients with sterile pancreatic necrosis and some with infected necrosis<sup>2</sup> can be managed without necrosectomy.

The development of MIN has led to two contrasting philosophies. The first advocates an orthodox 'step-down' approach in which open necrosectomy plays a primary role, with less invasive methods used for residual or subsequent collections. The second, or 'step-up', approach relies initially on less invasive techniques, with open necrosectomy used as a last resort. A multicentre randomized controlled trial comparing these two approaches is already under way in the Netherlands<sup>3</sup>. The challenges facing this trial include the variation in expertise with MIN and in the definitions of target lesions. Variations in the target lesions (location, fluid/mixed/solid, early/late, sterile/infected, single/multiple, wall thickness) and in the patients (co-morbidity, habitus, degree of organ dysfunction) require an individually tailored and flexible approach to the treatment of pancreatic necrosis.

MIN can be classified by the type of scope used (flexible endoscope, laparoscope, nephroscope) and the route of access (transperitoneal, transgastric, retroperitoneal). Nine possible combinations exist and, except for the endoscopic transperitoneal approach, all have been attempted. Each of the scopes and access routes has its advantages and disadvantages. The scopes can be compared for field of view, working channel for instruments and irrigation, external diameter, length, and flexibility and angulation. The routes can be compared for ease of access, risk of collateral injury and unnecessary contamination, and the ability to deal with multiple and complex collections.

The two approaches that have risen to favour are the endoscopic transgastric and nephroscopic retroperitoneal routes, probably because they are based on conventional operations. The former is an adaptation of an open surgical approach, developed to treat retrogastric pseudocysts<sup>4</sup>, that has been extended<sup>5</sup> to include endoluminal ultrasonographically guided transgastric puncture of the lesion, balloon dilatation of the track, insertion of multiple stents, direct basket extraction of necrosoma, and transpapillary stenting of the pancreatic duct. These technically demanding endoscopic manoeuvres are likely to become more widespread and supercede the laparoscopic transgastric operation. The endoscopic transgastric procedure avoids peritoneal contamination and external pancreatic fistula formation, but it may not be possible if there is no abutment

of the lesion against the stomach or duodenal wall.

The nephroscopic retroperitoneal procedure has been advocated by the Glasgow group<sup>6</sup> and appears now to be the most popular MIN approach. It is an adaptation of the open lumbotomy technique to left-sided organized pancreatic necrosis. Lessons learned from this new technique include that delay in intervention reduces bleeding and risk of perforation, that percutaneous drainage 'buys time' to stabilize critically ill patients before necrosectomy, that surgeons should help determine site and axis of the 'guidance drain', that the image intensifier should guide tract dilatation and define the extent and shape of the accessible cavity, that all the necrosoma does not have to be removed at one sitting, and that continuous cavity lavage should be provided through wide-bore drain(s). Ironically, necrosectomy itself is being seen as less important; it may simply ensure adequate drainage. In this light, it is hardly surprising that some have tried to rely solely on aggressive percutaneous drainage<sup>7</sup>, which requires increasing the size of the drains to more than 20 Fr, their frequent repositioning and/or replacement, and vigorous irrigation. Although some patients have avoided surgery by this means, others have not. Another approach to percutaneous drainage is the passive 'delay-until-liquefaction' method<sup>8</sup>.

MIN is now past the stage of feasibility testing – it can be done. What is now needed is evidence to guide the decision about which technique should be selected for which patient

and about the timing of its application. To allow the acquisition of appropriate data, patients requiring necrosectomy should be transferred to centres that are capable of evaluating the new methods and these patients should be recruited into randomized controlled trials. The advent of MIN has created some uncertainty about the role of open necrosectomy. The latter is probably best undertaken when expertise in MIN is unavailable or when MIN has proved unsuccessful. Data on MIN so far derive mostly from case series and are, as yet, insufficient to demonstrate clearly that the minimally invasive method is associated with a reduction in mortality; it does, however, appear to be associated with a reduction in duration of stay in the intensive care unit<sup>9</sup>.

Another challenge to progress is technical and involves the extraction of necrosoma. With MIN the 'educated finger' cannot be deployed for digital debridement. The small forceps and baskets currently in use mean tedious, piecemeal extraction. Promising technologies that require evaluation in this context are laparoscopic ultrasonic aspiration and ultrasonic tissue emulsification, but more efficient mechanical devices may ultimately give way to a biological approach promoting accelerated liquefaction.

Perhaps the most difficult challenge of all in the management of necrotizing pancreatitis is curbing the risk of death from fulminating organ failure

that occurs within the first week or two. Although not strictly a surgical challenge, it is certainly a most urgent one. Outcome is related to extent of organ dysfunction and response to initial intensive care support<sup>10</sup>, and a growing literature supports early and aggressive resuscitation with the preservation of intestinal perfusion and barrier function. This challenge must not be forgotten – infected pancreatic necrosis must be regarded as a failure of therapy rather than a surgical target. Still, until its prevention becomes possible, MIN, in a number of guises, will play an increasingly important clinical role.

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