

Scientific Research Process

1. This study benchmarked the severity of complications using the Accordion Severity Grading System in patients who underwent a major pancreatic resection for severe pancreatic injuries. The data presented is relevant and important because there is a lack of comprehensive datasets which specifically document outcome after resection of complex pancreatic injuries. Currently there are wide variations in the reported overall postoperative morbidity rates after pancreatic injuries due to non-standardised analyses. To rectify this shortcoming, an analysis of prospectively collected data derived from a comprehensive and dedicated institutional pancreatic trauma database which included clinical, operative and postoperative information on all patients treated for pancreatic trauma was performed of all adult patients who had a resection for a pancreatic injury to accurately determine the severity of complications.

2. Between January 1990 and April 2015 a total of 461 patients were treated for pancreatic injuries of whom 130 had a pancreatic resection for either grade 3, 4 or 5 injuries. The medical records of those who required a pancreatic resection for the injury were scrutinized. Information including operative, intensive care, radiology and endoscopy reports were reviewed and the data abstracted were entered by a specially trained nurse reviewer and recorded using a standardised data form after affirmation by a senior study surgeon. A comprehensive data set of complications were generated by this process and related key variables were recorded.

3. Postoperative complications were scored using the expanded Accordion Severity Grading System. In this study grade 1 and 2 complications were regarded as minor, grade 3 as moderate, 4 as serious and grade 5 complications as life-threatening. Grade 6 complications resulted in the death of the patient and included death from any cause within 30 days of surgery. The overall complication rate was reported as the number of patients with at least one complication. In patients with several complications, the highest graded complication was used for analysis of the complication severity. Overall 238 complications occurred in 95 (73%) patients of which 73% were grades 3-6. Patients more likely to have complications after pancreatic resection were older, had a revised trauma score <7.8, were shocked on admission, had grade 5 injuries of the

head and neck of the pancreas with associated vascular and duodenal injuries, required a damage control laparotomy, received a larger blood transfusion, had a pancreaticoduodenectomy and repeat laparotomies. Applying univariate logistic regression analysis, mechanism of injury, revised trauma score <7.8 , shock on admission, requiring damage control laparotomy, increasing injury grade and type of pancreatic resection were significant variables for complications. Multivariate logistic regression analysis however showed that only age and type of pancreatic resection were significant.

4. The hypothesis of this study was that specific knowledge of the incidence and severity of post-resection morbidity after a pancreatic injury would facilitate future comparative assessments and serve as a reference for improving outcome. The absence of an appropriate and defined methodology to measure and register peri-operative outcome, precludes the generation of validated outcome data, fundamental to accurate benchmarking of surgical performance and internal quality control. Both the number and severity of postoperative complications are recognised key short-term surrogate markers of the quality of operative intervention and surgical outcome. This Accordion Severity Grading System-based study benchmarked postoperative morbidity after pancreatic resection for trauma and established a rating against which others may be measured.

5. In applying the Accordion Severity Grading System, we have established a benchmark for pancreatic resections for trauma by using current standardized definitions for grading severity of pancreatic complication. The detailed outcome analysis provided may serve as a reference for future institutional comparisons. Benchmarking is not restricted to comparative analyses of outcome, but should serve as a mechanism for transforming surgical practice and enhancing quality of care. To further develop this, future studies should include the calculation of the total burden of multiple complications in individual patients by utilising the comprehensive complication index, a factor which is relevant in trauma patients with several injured organs.

Core Tip

Pancreatic injuries result in considerable morbidity and mortality rates if the injury is inadequately treated. This analysis benchmarked the severity of complications after pancreatic resection for trauma using the Accordion Severity Grading System. By applying univariate logistic regression analysis, the mechanism of injury, a Revised Trauma Score <7.8 , shock on admission to hospital, the need for an initial damage control laparotomy, an increasing pancreatic injury grade and the type of pancreatic resection were found to be significant variables for complications. However, multivariate logistic regression analysis showed that only age and the type of pancreatic resection were significant. Post-operative morbidity after pancreatic resection for trauma in this study was substantial and an increasing complication severity grade, as measured by the Accordion severity scale, required escalation of intervention and prolonged hospitalisation.

COMMENTS

Background

The pancreas is the least injured of the intra-abdominal solid organs but results in considerable morbidity and mortality rates if the injury is incorrectly assessed or inadequately treated. Outcome is influenced by the complexity of the pancreatic injury, the number and severity of associated vascular and visceral injuries, the duration of shock and the quality and nature of surgical intervention. Two-thirds of patients who survive more than 48 hours have major complications as a result of the pancreatic and associated injuries, and the one third of patients who die later do so because of intra-abdominal or systemic septic complications or multi-organ failure. Despite the substantial morbidity no studies have previously performed a detailed analysis of complications after pancreatic resection for trauma using standardized methodology.

Research frontiers

There is consensus that the modern management of complex pancreatic trauma is best achieved by collaborative team work between trauma and pancreatic surgeons.

However, the optimal management of complex pancreatic injuries remains undefined due to the lack of high quality evidence. Despite a plethora of papers on pancreatic trauma, none have specifically addressed the spectrum of complications as patterns of injury and methods of intervention have progressed. Earlier studies assessing outcome after pancreatic resections for major pancreatic injuries have applied unqualified primary endpoints with differing descriptions and definitions which consequently have resulted in flawed conclusions. This analysis evaluated post-resection complications by applying robust and reliable methodology and objective and reproducible end-points in a large cohort of consecutive patients treated at a tertiary referral center. Internationally accepted and validated definitions of complications and grading scores including the 6-scale Accordion Severity Grading System were used to benchmark the severity of complications

Innovations and breakthroughs

The present study represents the largest single center series of patients undergoing pancreatic resection for trauma. The number and severity of post-operative complications reflect the consequences of surgery in severe multiply injured patients. Associated injuries were common, in keeping with collateral damage seen with abdominal gunshot injuries. One half of patients had three or more associated injuries and the complexities of management were further compounded by associated vascular injuries present in one of every five patients. The dominant complications were infective, both intra-abdominal and systemic, respiratory, renal and related to bleeding. A substantial number of patients required a repeat laparotomy either for definitive management following an initial damage control laparotomy (i.e. delayed resection) or for intra-abdominal infection unresolved after percutaneous catheter drainage, control of intra-abdominal bleeding, or for small bowel obstruction. Overall 73% of patients had complications of which three quarters were Accordion grades 3-6. Patients more likely to have complications after pancreatic resection were older, had a revised trauma score <7.8, were shocked on admission, had grade 5 injuries of the head and neck of the pancreas with associated vascular and duodenal injuries, required a damage control laparotomy, received a larger blood transfusion, had a pancreaticoduodenectomy and repeat laparotomies. Applying univariate logistic regression analysis, mechanism of

injury, RTS <7.8, shock on admission, damage control laparotomy, increasing AAST grade and type of pancreatic resection were significant variables for complications. Multivariate logistic regression analysis however showed that only age and type of pancreatic resection were significant.

Applications

Postoperative morbidity after pancreatic resection for trauma in this study was considerable and an increasing complication severity grade, as measured by the ASGS, required escalation of intervention and prolonged hospitalisation. Accurate intraoperative decision-making is crucial for a favourable outcome. A wide spectrum of options need to be considered, including initial damage control with delayed resection and/or reconstruction which is applicable as the default option in a select group of unstable patients. In applying the Accordion scale, we have established a benchmark for pancreatic resections for trauma by using current standardized definitions for grading severity of pancreatic complication. This will facilitate future comparative assessments and serve as a reference for improving outcome. Benchmarking is not restricted to comparative analyses of outcome, but should serve as a mechanism for transforming surgical practice and enhancing quality of care. To further develop this, future studies should include the calculation of the total burden of multiple complications in individual patients by utilising the comprehensive complication index, a factor which is relevant in trauma patients with several injured organs

Terminology

The validated International Study Group of Pancreatic Surgery definitions of complications after pancreatic surgery provided an accurate, robust and consistent method to allow reliable comparisons of the incidence of post-operative pancreatic fistulas, bleeding and delayed gastric emptying. Similarly, the 6-scale Accordion Severity Grading System which discriminates post-operative complication severity following elective surgery on the basis of escalating interventional criteria, is now widely accepted as a credible, scoring system which is easy to apply and is reproducible with minimal inter-observer variability.

Peer-review

This is an interesting article based on the management of complex pancreatic injuries in 461 patients over a twenty five-year period containing a lot of important data. It is a well-written paper, documented and with acceptable outcome in such severe injuries.