

## SHORT COMMUNICATION

# Predicting Post-Pancreatoduodenectomy Complications – Is it Possible?

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Pancreatoduodenectomy (PD) remains the standard curative procedure for malignancies of the pancreatic head and periampullary region [1]. Refinements in the procedure over the last few decades were accompanied by a concomitant fall in perioperative morbidity and mortality [2]. However, increased surgical aggression in recent years aimed at treating borderline resectable tumours [3], namely tumours involving the superior mesenteric and portal vessels, has led to a resurgence of increased morbidity and mortality rates [4] prompting calls for careful introspection [5].

Over the years there have been numerous attempts to make the procedure more patient-friendly by reducing associated morbidity and enhancing recovery [6] through the use of clinical pathways [7]. We have previously investigated the clinical benefits of intraoperative strategies such as standardisation of the surgical technique [8, 9], popularised surgical techniques to improve outcomes [10, 11], highlighted the performance of surgery in high volume centres [12], as well as emphasized the importance of restriction of blood loss during surgery (manuscript in submission). Other perioperative interventions investigated to this end have been the choice and appropriate usage of antibiotics [13, 14]. We have also stressed the need for quality improvement in PD as a whole [15].

Despite all the above strategies, morbidity rates continue to be high even in high volume centres [2]. The fall out of post-PD complications is not only the financial implications to the patient or the national health service (manuscript in submission), but more importantly the effect on the patient itself in terms of need for reoperation, delayed recovery and prolonged return to normal activity leading to a lowered morale, and worst of all, the risk of death [16]. Thus, it would seem intuitive to develop a

mechanism to predict the development of complications following PD or more importantly evolve strategies to diagnose complications early in order to permit 'patient rescue' and avert death [17].

Are and colleagues [18] incorporated co-morbidities into a nomogram to be applied preoperatively to help predict the risk of postoperative mortality. While this tool is invaluable in the presurgical counselling of patients on a rather personalised level, it may not be of use in early detection of complications as, firstly, it was not designed to do so, and, secondly, we have repeatedly noted a lack of correlation between co-morbidities, in general, and post-operative outcomes in PD [7, 13]. Other surgeons have suggested the use of preoperatively obtained imaging features of the pancreas such as pancreatic density and duct width [19] or differences in signal intensity between the pancreas and liver or spleen (on magnetic resonance imaging) [20] to predict the development of pancreatic anastomotic leak (POPF). However, here too, our data on intraoperative pancreatic duct diameters and texture [7, 13] have failed to correlate with complication risk – possibly due to our low POPF rates, in general.

One strategy that has been universally used to help alert surgeons to the development of post-PD anastomotic leaks is the placement of intraoperative drains [21]. In fact, the latest randomized controlled trial suggested that non placement of drains delayed detection of complications and contributed to a significantly increased mortality [22]. Despite such strong evidence in favour of drains, it is equally well appreciated that drains may not always work leading to either the avoidance of placement of drains [23] or early removal in case the drain was placed at the time of surgery [24]. Some surgeons resort to performing a computed tomography scan (CT scan) at the slightest suspicion of complications (development of fever or a rising white cell count or both). The pitfall of CT scans is that there are a number of normal changes in the postoperative period that may be misinterpreted as complications [25] leading to unnecessary interventions with their own attendant risk of complications.

Thus, this area of pancreatic surgery certainly lends itself to further research into developing better strategies for the early recognition and timely intervention in the post-operative setting of patients undergoing PD.

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One promising yet unexplored avenue is the analysis of deviations from a clinical pathway with an aim to determine if they are associated with complications. Clinical pathways are essentially standardized care plans for individual clinical problems that detail essential steps in patient care bearing in mind the expected postoperative course with the overall aim of improving outcomes. The strategies employed within the clinical pathway are standard procedures such as removal of nasogastric drains or indwelling catheters, patient ambulation, timing of commencement of diet, and physiotherapy. The only difference being the emphasis on the word 'standardized'. Assessing whether deviations from the normal pathway are early predictors of complications within a well defined system appears promising. It may provide valuable information that can be used in any hospital in any part of the world irrespective of whether they choose to follow a clinical pathway, or not, to detect early complications and manage them appropriately thereby reducing the attendant personal and economic fallout.

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### Conflict-of-interest

The authors have no conflict of interest to declare.

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