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Short Communication
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Emergency Surgery - Not for the Faint Hearted; Open Appendicectomy in a Heart Transplant Recipient

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Introduction

A 33 year old woman presented to the surgical assessment unit, with a two-day history of lower abdominal pain associated with general malaise. Her past medical history included heart transplant 8 years ago for cardiomyopathy, hypertension and a recent open umbilical hernia repair with mesh. Her medications included oral immunosuppressive medications (tacrolimus and mycophenalate) and anti-hypertensive's (amlodipone). She was not known to have any allergies.

Routine observations on admission were normal. Abdominal examination demonstrated a non-distended abdomen with localized guarding and rebound tenderness in the right iliac fossa.

ECG was in sinus rhythm with heartbeat of 96 Beats per Minute (BPM). A recent echocardiogram demonstrated normal ventricular and valvular function. Routine biochemistry was largely unremarkable with a mildly raised CRP at 38 but normal white cell count and no evidence of neutrophilia. Computerized tomography showed uncomplicated acute appendicitis and a post-operative seroma around her previous open umbilical hernia repair site.

Broad spectrum intravenous antimicrobial treatment was commenced prior to surgery and the case was discussed with the patient's transplant team. It was advised that immunosuppressant agents be continued as per her usual dose. Additional treatment with steroids or anti-fungals was not recommended.

An open appendicectomy was performed. The appendix was divided and delivered through a Lanz incision using an Alexi's wound protector. The patient remained hemodynamically stable throughout the procedure with systolic BP ranging from 98 mmHg to 118 mmHg. She was admitted to a general surgical ward post-operatively where she made an unremarkable recovery and was discharged three days later. The patient returned 2 weeks post-operatively for a planned wound review and was noted to have a clean well-healing scar. No major complications were recorded within the 30-day post-operative period and histological examination of the specimen confirmed acute appendicitis.

Discussion

A clear understanding and appreciation of the altered physiology in particular cardiac physiology in transplant patients is vital. This knowledge is crucial to the general surgeon and will help guide with decisions such as the best approach to intra-abdominal surgery. In addition it is important to recognize that transplant patients are often on of a cocktail of immunosuppressive medications and the impact this may have on post-operative complications, in particular surgical site infections. Effective management of such a patient is best approached with the aid of a multidisciplinary team.

Altered cardiac physiology in transplant patients and the impact on intra-abdominal surgery

The transplanted heart lacks both sympathetic as well as parasympathetic innervation. The loss of vagal tone results in a higher resting heart rate; between 90-110 Beats per Minute (BPM) [1]. Another key change in physiology is that the transplanted heart depends entirely on venous return. It is said to be 'pre-load dependant' [2]. In normal cardiac physiology, hypovolaemia results in an increase in cardiac output by increasing heart rate and increasing contractility. This is achieved by the stimulation of neurohormonal pathways as well as the activation of Frank-Starling mechanism [3].

A transplanted heart cannot respond to sympathetic and parasympathetic stimuli, and is therefore dependant entirely on venous return [1,2]. This is an important consideration in intra-abdominal surgery, as many gold standard approaches are laparoscopic [4]. Laparoscopic surgery

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involves establishing pneumoperitoneum. The increase in intra-abdominal pressures during surgery may decrease venous return and this in turn may reduce heart rate. Unfortunately a denervated heart will be unable to compensate by utilizing neurohormonal pathways due to the reasons discussed above [1,2]. In the case reported here, this altered cardiac physiology was the primary reason an open approach was adopted. Whilst laparoscopic appendicectomy, is now the gold standard approach, in this case an open approach was in the patient's best interest.

Immunosuppression: surgical considerations

To reduce the risk of rejection, transplanted patients are on a combination of immunosuppressant medications. The commonest combination is tacrolimus and mycophenalate with or without prednisolone [2]. Whilst an important, anti-rejection strategy, one of the key considerations post-operatively is the increased risk of infections. In particular the increased risk of surgical site infections [5]. In our case this was an important consideration for several reasons. Firstly not only was our patient immunosuppressed, an additional factor to consider was the surgical approach. An open approach is associated with increased risk of surgical site infections [6]. To reduce this risk, intra-operatively an Alexi's wound retractor was used. This offered protection to the wound edge during the operation, in particular during dissection of the acutely inflamed appendix. An additional advantage of using an Alexi's wound retractor was to confer better visibility intra-operatively facilitating the identification of the appendix prior to dissection.

Effective multidisciplinary approach

In order to effectively manage transplant patients it is important to involve a number of teams.

Pre-operatively, as per Enhanced Recovery after Surgery (ERAS) [7] protocol, the patient was counseled. Information regarding the approach was discussed with the patient and consent was obtained for an open appendicectomy, due to reasons discussed above. Additionally, advice was sought from the patient's transplant team. In particular, guidance was sought over the need to continue immunosuppression pre and post operatively. Furthermore a clear direction was sought for the need to start steroid and initiate anti-fungal therapy. The need for anti-microbials was also discussed with the microbiologists.

Pre-operatively, the case was discussed with cardiologist and cardiac physiologists to ensure that the transplanted heart was optimized prior to general anesthesia. All essential imaging and cardiac physiology tests (echocardiogram, ECG) were conducted to the highest standard. Anesthetic opinion was sought both pre-operatively and intra-operatively, paying particular regard to goal directed fluid management and effective use of pain management. In accordance with ERAS intra-operative protocols, the incision was deliberately made as small as possible and care was taken to ensure strict aseptic control was maintained throughout. Despite a small incision, surgical visibility was adequate due to the use of the Alexis wound retractor.

Post-operatively, the patient was discussed with the physiotherapists and early mobilization was encouraged with good oral pain control. Once again in keeping with the ERAS protocols, the patient was encouraged to start oral intake early and effective pain management was prescribed.

Effective management of such patients is dependent on input from a number of specialties. Strict adherence to the ERAS protocols pre, peri and post-operatively ensures that patients are offered the best possible care allowing them to return to their normal activities of daily life sooner and decreasing post-operative complications.

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