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A priority driven ABC approach to the emergency management of high energy pelvic trauma improves decision making in simulated patient scenarios

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ABSTRACT

Introduction: An ABC priority driven approach to the management of high energy pelvic injuries has been developed and applied as a teaching tool. A prospective study assessed whether trainees taught this ABC aide memoire gave better priority driven care in simulated patient scenarios. They were compared directly to colleagues undergoing the same pelvic training but without reference to the ABC concept.
Methods: Orthopaedic trainees were formally assessed by viva scenario upon their pelvic trauma management 6 weeks after a pelvic trauma teaching event. Trainees all received standard pelvic trauma teaching but were randomised into two groups. One group alone had an introduction to the ABC algorithm. Inclusion criteria were trainees belonging to the same deanery teaching group with similar levels of training and experience in pelvic trauma. Those completing a pelvic trauma post or teaching in pelvic trauma were excluded.
Results: There were 20 trainees included and three scenarios giving 60 scores. The mean year of training or the number of pelvic trauma cases experienced did not differ significantly between the groups ($p = 0.426$ and $p = 0.347$). The ABC teaching concept yielded significant improvements in several aspects: coagulopathy assessment and management ($p = <0.001$); urological injury ($p = 0.047$), appropriate prioritisation ($p = 0.006$) and bowel injury/open fracture assessment ($p = 0.007$). A poorer response was seen in CT assessment ($p = 0.004$).
Discussion and conclusion: The ABC priority driven approach to pelvic trauma management provides structure when decision making. This method improves clinician's recall, prioritisation and potentially clinical outcomes.

Introduction

Patients with high energy fractures of the pelvic ring often have further associated injuries and reported historical mortality rates of up to 58.3% [1]. The combination of skeletal, soft tissue injuries and life threatening haemorrhage represents a challenge to the treating physician. Frequently patients can be coagulopathic [2] and as such haemodynamic instability remains the most common cause of early mortality [3]. Open pelvic injuries and those disrupting the pelvic viscera need early recognition [4] and prompt treatment. This minimises mortality from deep pelvic sepsis and multiple organ failure [5]. In addition these patients have complex needs, assessment and treatment. An initialled acronym has been shown to be a useful tool to aid and direct this management [6,7]. Direct improvements in patient outcomes have been reported when such an approach is used to aid clinical decision making [8].

The ABC system was developed at Imperial College Hospital as a teaching tool to allow the early assessment of multiply injured patients that presented to the hospital when it became a major trauma centre. It is based on the BOAST 3 guidance developed by the British Orthopaedic Association. It was partly developed to ensure patients are optimised prior to transfer for CT scanning, interventional radiology or theatre. A prospective study was performed to assess whether trainees taught this ABC initialled aide memoire gave better priority driven care in simulated patient

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scenarios. They were compared directly to their colleagues that underwent the same pelvic training but without reference to the ABC concept.

Materials and methods

A comparative study was performed on the results of a formative assessment of trauma and orthopaedic trainees 6 weeks after a pelvic trauma management teaching event. Trainees were members of the same deanery teaching group. In order to standardise candidates questionnaires were used to determine the candidates' level of training and previous experience in treating patients with high energy pelvic injuries to ensure the groups were similar. Exclusion criteria were applied of anyone having completed a post with a strong element of pelvic trauma or previously completed a pelvic trauma training course. The trainees were invited to a pelvic training afternoon. This included an hour long presentation (40 slides) on the principles of pelvic trauma patient management including classification, associated injuries, early and definitive management. This training session was led by two experienced pelvic and acetabular surgeons. Trainees were randomised into a control and an intervention group. The intervention group were given the same talk but with the addition of 5 slides covering the ABC concept. The trainees were blinded as to which group they were in.

Six weeks after the pelvic training sessions were delivered, candidates were formally assessed using viva scenarios of pelvic trauma. Candidates were assessed using the same examination methods and principles utilised by the Royal College of Surgeons FRCS Orth examination. The validated assessment consisted of three standardised patient scenarios including patient photographs, primary survey radiographs [6], and descriptions suggesting grade IV haemorrhagic shock associated with an isolated pelvic ring injury. The three cases presented included an open book (OTA B1), a vertical shear (OTA C1) and a lateral compression (OTA B2) [9] fracture pattern. Clinical cues suggested open fractures and urological injury. The trainees were asked to assume no further assessment or resuscitation of the patient had taken place. They were asked to produce a clinical plan for the emergency assessment and management of the patient. The responses were stratified into assessment criteria based upon the type of clinical problem and priorities based upon recent national guidance [10]. Examiners and markers were blinded to which group and hence teaching experience the trainees belonged.

The impact of the ABC pelvic trauma algorithm was analysed by direct comparison to the control group. A list of the assessment criteria which represent the clinical priorities is given in Fig. 1. A secondary outcome measure was to determine if the plan was appropriately prioritised, with an emphasis on resuscitation. The priority in the simulated patient scenarios was an emphasis on acute resuscitation of the patient and appreciation of the associated injuries, as it was made clear to the trainees that no attempt to identify or instigate a systematic resuscitation of the patient had been made.

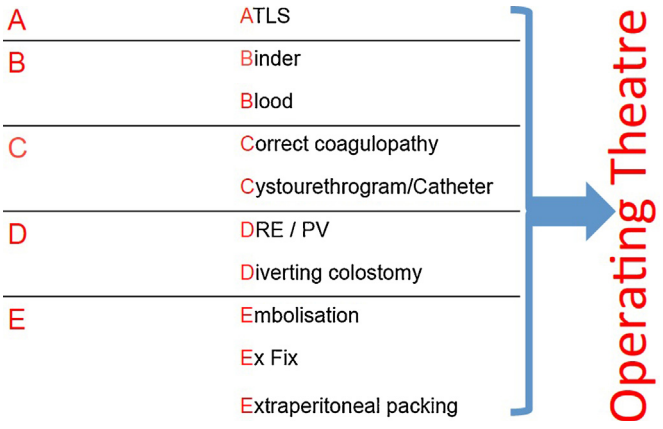

Fig. 1. Pelvic assessment criteria applied as an educational priority list.

Statistical analysis

The data generated was both non-parametric and parametric with a mixture of categorised and continuous scoring. Groups were compared directly using chi squared test for non-parametric data and Students *t*-test for parametric data. Analysis was conducted with SPSS version 21.0 (IBM, Armonk, New York), and a *p*-value of <0.05 was considered statistically significant.

Results

Fifteen candidates were removed from the study due to not meeting the inclusion criteria. Nine candidates were randomised to the 'control' group and 11 candidates randomised to the 'ABC' teaching group. Candidates were analysed over three clinical scenarios, giving 27 responses in the control group and 33 in the 'ABC teaching group'. Key responses included: primary survey, pelvic binder application, resuscitation with blood and blood products, identification of coagulopathy, assessment for urological and bowel injuries, use of an external fixator, interventional radiology and extraperitoneal packing.

The mean year of training of the groups was not significantly different for ABC vs control (4.4 vs 4.9, $p = 0.426$, range 2–6). The mean number of high energy pelvic cases treated by the trainees was not significantly different for ABC vs conventional (3 vs 1.4, $p = 0.347$, range 0–13).

Table 1 represents the responses of trainees clinically stratified across the subject groups. The simulated patient scenario testing at 6 weeks suggested significant improvements in the ABC group in several categories: improved responses in assessment and management of possible coagulopathy (55% vs 0%, $p = <0.001$); urological pathology (97% vs. 78%, $p = 0.047$) and assessment for bowel injury/open fracture (60% vs 26%, $p = 0.007$).

A trend was noted for improved responses for resuscitation (78% vs 74%, $p = 0.67$) with blood and blood products and in the initiation of antimicrobial therapy (33% vs 15%, $p = 0.09$).

Conventional teaching subjects scored statistically higher in one category – CT scanning (81% vs 45%, $p = 0.004$). A preference was noted in the conventional teaching group to prioritise CT scanning in the initial management of patients.

The ABC group were noted to have a greater number of responses with appropriately prioritised management plans, ranking the application of a pelvic binder and resuscitation with blood and blood products prior to further management. This was found to be statistically greater compared to the conventional teaching group (78% vs 44%, $p = 0.006$).

Discussion

High energy pelvic ring fractures are uncommon but of serious consequence, with a reported incidence of 10 per 100,000 population and a mortality rate of 23% [11]. The ABC priority driven approach to the emergency management of pelvic trauma has been developed as a teaching aid to provide a framework for decision making when faced with this difficult patient group. Guidelines for the treatment of pelvic trauma have been published [2,12] and although useful, are lengthy and can be difficult to recall in pressured situations.