Injury, Int. J. Care Injured 46 (2015) 1059–1063

Contents lists available at ScienceDirect

Injury

journal homepage: www.elsevier.com/locate/injury

Which pelvic ring fractures are potentially lethal?

S. Ruatti [a,*], S. Guillot [b], J. Brun [b], F. Thony [c], P. Bouzat [b], J.F. Payen [b], J. Tonetti [a]

[a] Hôpital Michallon, Alps Trauma Centre, University Hospital, Department of Orthopaedic and Trauma Surgery, BP 217 X, 38043 Grenoble Cedex 09, France
[b] Hôpital Michallon, Alps Trauma Centre, University Hospital, Department of Anesthesia and Intensive Care, BP 217 X, 38043 Grenoble Cedex 09, France
[c] Hôpital Michallon, Alps Trauma Centre, University Hospital, Department of Radiology and Medical Imagery, BP 217 X, 38043 Grenoble Cedex 09, France

ARTICLE INFO

Article history:
Accepted 23 January 2015

Keywords:
Pelvic ring
Embolisation
Bleeding
Classifications
Mortality

ABSTRACT

Purpose: Global mortality of polytraumatised patients presenting pelvic ring fractures remains high (330%), despite improvements in treatment algorithms in Level I Trauma Centers. Many classifications have been developed in order to identify and analyse these pelvic ring lesions. However, it remains difficult to predict intra-pelvic haemorrhage. The aim of this study was to identify pelvic ring anatomical lesions associated with significant blood loss, susceptible to lead to life-threatening haemorrhage.
Material and method: This study focused on a retrospective analysis of patients' medical files, all of whom were admitted to one of the shock rooms of Grenoble University Hospital, France, between January 2004 and December 2008. Treatment was given according to the institutional algorithm of the Alps Trauma Center and Emergency North Alpine Network Trauma System (TRENAU). Different hemodynamical parameters at arrival were measured, and the fractures were classified according to Young and Burgess, Tile, Letournel and Denis. One hundred and ninety seven patients were analysed. They were subdivided into two groups, embolised (Group E) and non-embolised (Group NE).
Results: Group NE included 171 patients with a mean age of 40.2 ± 8.7 years (15–90). Group E included 26 patients with a mean age of 41.6 ± 5.3 years (18–67). Twenty-six patients died during the initial treatment phase. Eleven belonged to Group E and 15 to Group NE. Mortality was significantly higher in Group E (42.3% vs 8.8% in Group NE) ($p < 0.05$).

There were significantly many more Tile C unstable fractures in Group E ($p = 0.0014$), and anterior lesions, according to Letournel, with pubic symphysis disruption were significantly more likely to lead to active bleeding treated by selective embolisation ($p = 0.0014$). Posterior pelvic ring lesions with iliac wing fracture and transforaminal sacral fractures (Denis 2) were also more frequently associated with bleeding treated by embolisation ($p = 0.0088$ and $p = 0.0369$ respectively).
Discussion/conclusion: It appears that in our series the primary identification and classification of osteo-ligamentous lesions (according to Letournel and Denis' classifications) allows to anticipate the importance of bleeding and to adapt the management of patients accordingly, in order to quickly organise angiography with embolisation.

Introduction

High velocity pelvic ring fractures are life-threatening injuries [1–3]. Intra-pelvic haemorrhage, venous or arterial, associated with other thoracic, abdominal, and cranial lesions, explain the high mortality rates in polytraumatized patients with pelvic ring fractures [1–11]. The recent development of endovascular techniques in order to control intra-pelvic arterial bleeding allows us to get a quantification and cartography of vascular lesions, and effectively treat haemorrhage [11].

Different classifications analyse pelvic ring lesions. In 1987, Young and Burgess suggested a classification based on lesional mechanism [12]. Tile analysed horizontal and vertical pelvic ring stability [13]. On the other hand, Letournel and Denis present descriptive classifications of pelvic ring fractures [14,15]. According to our literature review, Tile and Young and Burgess' classifications could not predict higher risks of intra-pelvic bleeding [16,17,25].

Therefore we decided to do an observational study to analyse pelvic ring lesions with and without vascular lesions in order to predict haemorrhagic risk based on different classifications.

* Corresponding author. Tel.: +33 685446857.
E-mail address: sruatti@chu-grenoble.fr (S. Ruatti).

http://dx.doi.org/10.1016/j.injury.2015.01.041
0020–1383/

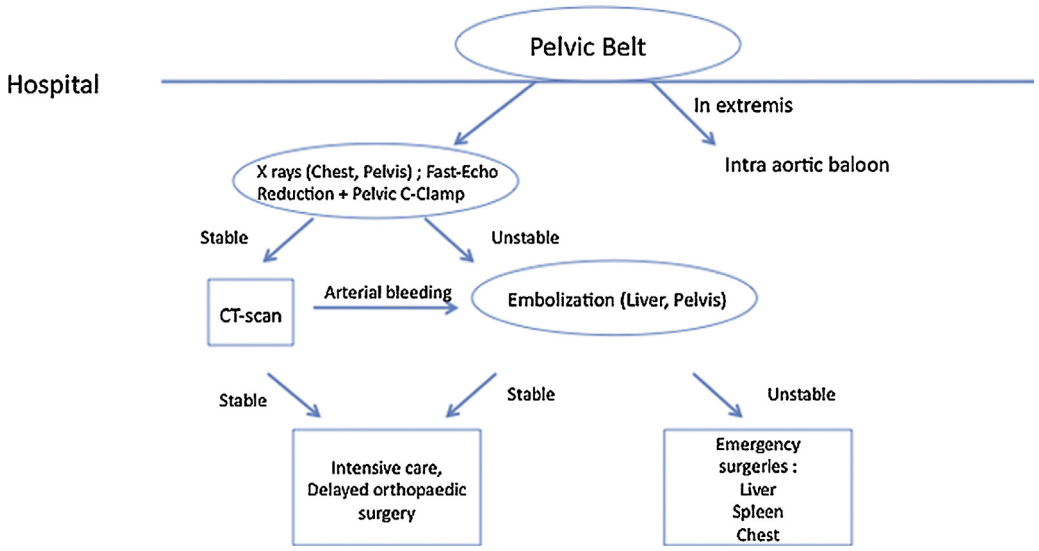

Fig. 1. Algorithm for treatment of severe pelvic ring lesions (Alps Trauma Centre – Grenoble).

Material and methods

This observational study was done through a retrospective analysis of patients' files, admitted to one of the shock rooms of Grenoble University Hospital (Level I Trauma Center, Alps Trauma Center), between January 2004 and December 2008. Inclusion criteria were the existence of a pelvic ring fracture. The only exclusion criterion was an incomplete radiologic file, making the identification and classification of osteo-ligamentous injuries impossible.

The following parameters have been analysed: age, gender, cause of injury, ISS score, IGS 2 score, abbreviated injury score (AIS) for cranial, chest, abdomen, pelvis and limbs, death in shock room.

The following haemodynamic parameters at arrival were measured: systolic blood pressure (mmHg), heart rate (bpm), shock index [18], use of vasopressor amines, blood haemoglobin rate (g/dl), prothrombine rate (%), blood fibrinogen rate (g/l), thrombocyte numeration (G/l), blood lactate level (mmol/l), transfusion of more than 6 blood units (CG), transfusion plasma (PFC).

We managed these patients according to the institutional algorithm of the Alpine Trauma Center and Emergency North Alpine Network Trauma System (TRENAU) (Figs. 1 and 2). During the pre-hospital phase, a pelvic contention belt was applied by medical staff each time a pelvic trauma was suspected. At hospital admission, all patients had a standard lesional check up with X-rays (chest, pelvis, limbs if suspicion of trauma) and a fast-Echo looking for intra-abdominal or intra-thoracic lesion. A pelvic C-clamp was used in case of haemodynamic instability and confirmed pelvic lesion. Injected full body CT-scans were performed for all stable patients. An arterial or venous leak on the CT-scan was an indication for emergent embolisation.

Very hemodynamically unstable patients (in extremis) were managed with an intra-aortic baloon before selective embolisation [11].

Every X-ray and CT scan has been reviewed by a senior orthopaedic surgeon (J. Tonetti). Fractures were classified according to Young and Burgess [12], Tile [13], Letournel [14], and Denis [15].

In order to identify lesions that could lead to massive bleeding, our series has been divided into two groups of patients, embolised (Group E) or not (Group NE).

The association between embolisation and anatomical classifications has been evaluated with a Chi square test for quantitative values, and Student test for qualitative ones. Statistical significance level has been established for a p-value under 0.05.

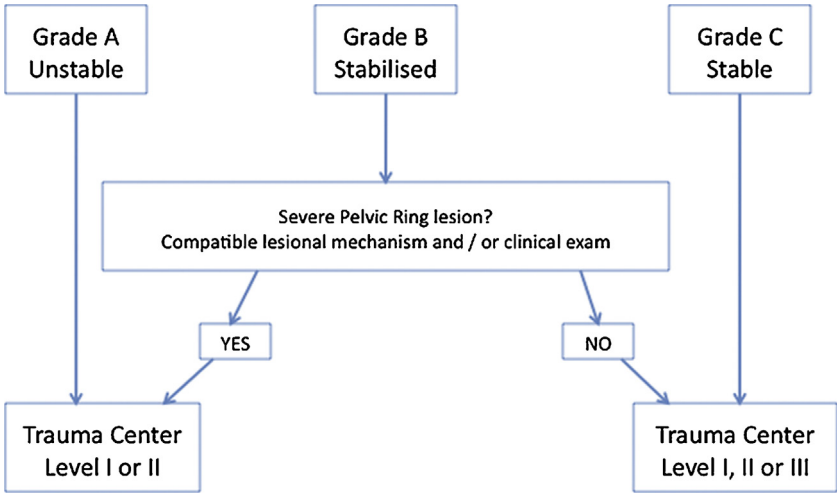

Fig. 2. Pre-hospital algorithm (TRENAU) for polytraumatised patients with severe pelvic ring lesion [3].