

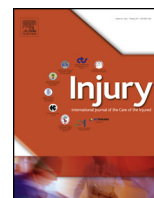


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Full length article

Interventional Radiology service provision and practice for the management of traumatic splenic injury across the Regional Trauma Networks of England

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ARTICLE INFO

Keywords:

Spleen
Splenic trauma
Interventional radiology
Splenic embolisation
Regional trauma networks

ABSTRACT

Introduction: The management of blunt splenic injuries (BSI) has evolved toward strategies that avoid splenectomy. There is growing adoption of interventional radiology (IR) techniques in non-operative management of BSI, with evidence suggesting a corresponding reduction in emergency laparotomy requirements and increased splenic preservation rates. Currently there are no UK national guidelines for the management of blunt splenic injury. This may lead to variations in management, despite the reorganisation of trauma services in England in 2012.

Materials and methods: A survey was distributed through the British Society of Interventional Radiologists to all UK members aiming to identify availability of IR services in England, radiologists' practice, and attitudes toward management of BSI.

Results: 116 responses from respondents working in 23 of the 26 Regional Trauma Networks in England were received. 79% provide a single dedicated IR service but over 50% cover more than one hospital within the network. All offer arterial embolisation for BSI. Only 25% follow guidelines.

In haemodynamically stable patients, an increasing trend for embolisation was seen as grade of splenic injury increased from 1 to 4 (12.5%–82.14%, $p < 0.01$). In unstable patients or those with radiological evidence of bleeding, significantly more respondents offer embolisation for grade 1–3 injuries ($p < 0.01$), compared to stable patients. Significantly fewer respondents offer embolisation for grade 5 versus 4 injuries in unstable patients or with evidence of bleeding.

Conclusion: Splenic embolisation is offered for a variety of injury grades, providing the patient remains stable. Variation in interventional radiology services remain despite the introduction of regional trauma networks.

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Introduction

The spleen is one of the most frequently injured organs in adult blunt abdominal trauma [1,2]. Historically a large proportion of patients with blunt splenic injury (BSI) underwent emergency laparotomy emergency splenectomy in order to reduce the risk of significant haemorrhage. This has associated morbidity and mortality risk, including overwhelming post-splenectomy

infection and lifelong antibiotic prophylaxis. Non-operative management of BSI by clinically observation alone has a reported failure rate of 34%–52%, with these patients often requiring subsequent splenectomy [1,2]. The development of advanced endovascular interventional techniques has led to greater consideration of non-operative management (NOM) for haemodynamically stable patients. Splenic artery angiography and either selective embolization for active haemorrhage or proximal splenic arterial embolization, utilised to reduce risk of delayed haemorrhage, can be used. Worldwide, the majority of trauma centres now opt for NOM in haemodynamically stable patients with BSI [2,3]. As a result splenic artery embolisation (SAE) is increasingly performed to augment NOM protocols and reduce the need for operative intervention.

CT is the imaging modality of choice for haemodynamically stable patients with blunt abdominal trauma [4]. Splenic

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injuries can be categorised radiologically using The American Association for the Surgery of Trauma (AAST) grading system [5,6]. CT findings along with the clinical condition of the patient are used to direct appropriate management strategies and inform decision-making regarding the use of interventional radiology techniques [7].

The re-organisation of major trauma services in England in 2012 led to the introduction of Regional Trauma Networks. Each network has a major trauma centre (MTC) providing specialist trauma care, and several regional trauma units. The aim was to improve trauma associated mortality and morbidity by increasing access to specialist teams and facilities, and resolve service variation. However despite the reorganisation of services there is no UK national guidance for the management of BSI. Variation in both practice and availability of interventional radiology may therefore exist across the Regional Trauma Networks. Availability of interventional radiology is likely to influence how BSI is managed. This study sought firstly to identify the availability of interventional radiology services across England, and secondly to investigate experience of splenic artery angiography and attitudes toward the management of BSI amongst interventional radiologists in the advent of Regional Trauma Networks.

Materials and methods

An online survey was distributed using SurveyMonkey® (Dublin, Ireland) to all 500 UK members of the British Society of Interventional Radiologists. Data collected included service provision, experience of splenic angiography and individual perceived relevant indications and preferred techniques, and departmental procedures and policies (see Appendix A). Replies from radiologists working outside of England were excluded as these regions are yet to implement regional trauma networks.

Data was analysed in Microsoft Excel and statistical analysis was undertaken using GRAPHPAD PRISM version 6 (San Diego, USA). Fisher's exact test and Chi Square were used to analyse categorical variables, with a p -value < 0.05 being considered significant.

Results

116 responses were received. This included respondents working in 23 of the 26 major trauma networks in England. 48% (56/116) of respondents are primarily based in a major trauma centre. Regions outside of England are yet to develop regional trauma networks so responses from these units (3 responses) were excluded from this study. 113 respondent's questionnaires were analysed. Individual question response rate varied from 97% (113/116) to 3% (3/116).

Service provision

Response rates for these questions varied from 97% (113/116) to 87% (101/116). 97% (110/113) of respondents contribute to an interventional radiology emergency service. The majority of respondents (79%, 80/101) provide this as a single service (i.e. intervention alone), whilst the remaining 21% (21/101) provide interventional radiology alongside a general emergency 'on call' radiology service. The majority (56%, 62/110) of Consultant Radiologists cover multiple hospitals during an 'on call' emergency shift. 35% (38/110) providing an interventional radiology service for three or more hospitals.

Angiography and embolisation for the management of acute bleeding is available in all of the 23 trauma networks included in this study. A 24-h, seven-day-a-week service is available for the patients of 80% (90/113) of the respondents. The remaining 20%

(23/113) have reduced availability; limited to Monday-Friday 09:00-17:00.

Experience of splenic artery embolization

Response rates for these questions varied from 96% (111/116) to 84% (98/116). 92% (102/111) of all respondents work in institutions where all interventional radiologists contributing to the on call rota are trained to perform splenic artery embolisation. 35% (34/98) of respondents have performed more than five SAE for trauma in the past three years. Only 8% (8/98) have performed more than ten SAE in the same time period. However, the number of respondents performing more than ten angiography and embolization for any condition in the past three years increases to 34% (33/98).

Patient suitability and preferred techniques

Response rates for these questions varied from 83% (96/116) to 48% (56/116). Only 25% (24/96) of respondents follow guidelines for when to perform SAE. Guidelines used included local hospital guidelines, Eastern Association for the Surgery of Trauma (EAST) [8], American Association for the Surgery of Trauma (AAST) [9], Cardiovascular and interventional Radiological Society of Europe (CIRSE) evidence [10] and evidence from up-to-date [11]. In haemodynamically stable patients, an increasing trend for embolisation was seen as grade of splenic injury increased from AAST grade 1–4 (12.5%–82.14%). In unstable patients or those with radiological evidence of bleeding, significantly more respondents would offer embolisation for grade 1–3 injuries ($p < 0.01$), compared to stable patients. In stable patients no difference was observed in the management of grade 4 and 5 injuries. Significantly fewer respondents offer embolisation for grade 5 vs. 4 injuries in unstable patients or with evidence of bleeding. From respondents' free text comments, we identify that a patient individualised and multi-disciplinary approach is often used in deciding suitability for embolisation.

83% (62/75) of respondents offer both main artery embolisation and highly-selective arterial embolisation (HSE) for blunt splenic injury. 12% (9/74) perform only main artery embolisation and 5% (4/75) favour HSE. The site of bleeding was considered the most important determining factor in choosing between these two techniques, by 70% (39/56) of respondents. Other factors identified by respondents as playing a role in choice of embolisation technique include; vessel anatomy, patient stability, presence of active bleeding, risk of local complications, grade of injury and the presence of pseudoaneurysm. Coil embolisation is the main embolic method used by respondents (100%, 74/74) although a range of embolic agents are available for use in SAE.

Success and complications

Response rates for these questions varied from 59% (68/116) to 56% (65/116). In 24% (16/67) of respondents' experience, repeat SAE has been performed within 72 h of initial embolisation. 43% (28/65) respondents report subsequent post embolisation splenectomy/splenorrhaphy. 19% (13/68) of respondents reported experiencing direct splenic artery complications related to embolisation, including rupture (3/68, 4%), dissection (4/68, 6%) and migration of embolic device (6/68, 9%).

Discussion

This study demonstrates current trends in service provision, availability and practice of interventional radiology in the management of blunt splenic injury across England. The

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