Original article

Survey of French spine surgeons reveals significant variability in spine trauma practices in 2013

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ABSTRACT

Background: In France, attempts to define common ground during spine surgery meetings have revealed significant variability in clinical practices across different schools of surgery and the two specialities involved in spine surgery, namely, neurosurgery and orthopaedic surgery.

Objectives: To objectively characterise this variability by performing a survey based on a fictitious spine trauma case. Our working hypothesis was that significant variability existed in trauma practices and that this variability was related to a lack of strong scientific evidence in spine trauma care.

Methods: We performed a cross-sectional survey based on a clinical vignette describing a 31-year-old male with an L1 burst fracture and neurologic symptoms (numbness). Surgeons received the vignette and a 14-item questionnaire on the management of this patient. For each question, surgeons had to choose among five possible answers. Differences in answers across surgeons were assessed using the Index of Qualitative Variability (IQV), in which 0 indicates no variability and 1 maximal variability. Surgeons also received a questionnaire about their demographics and surgical experience.

Results: Of 405 invited spine surgeons, 200 responded to the survey. Five questions had an IQV greater than 0.9, seven an IQV between 0.5 and 0.9, and two an IQV lower than 0.5. Variability was greatest about the need for MRI (IQV = 0.93), degree of urgency (IQV = 0.93), need for fusion (IQV = 0.92), need for post-operative bracing (IQV = 0.91), and routine removal of instrumentation (IQV = 0.94). Variability was lowest for questions about the need for surgery (IQV = 0.42) and use of the posterior approach (IQV = 0.36). Answers were influenced by surgeon specialty, age, experience level, and type of centre.

Conclusion: Clinical practice regarding spine trauma varies widely in France. Little published evidence is available on which to base recommendations that would diminish this variability.

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1. Introduction

Since the French Spine Surgery Society (SFCS) was created in the 2000s, attempts to define common ground during the Society’s annual meetings have revealed significant variability in practices across different schools of surgery and the two specialities involved in spine surgery, namely neurosurgery and orthopaedic surgery. This variability is particularly marked regarding the management of trauma patients, because the more experienced surgeons tend to devote less time to trauma and substantial clinical equipoise exists within the field of spine trauma.

We therefore sought to objectively characterise this variability by performing a survey based on a fictitious spine trauma vignette. The methodology used to evaluate healthcare practices based on a clinical vignette has been extensively validated [1,2]. Its use has expanded recently and extends to the field of spinal conditions [3–7]. Our secondary goal was to evaluate publications on the topics for which answer variability was greatest. Our working hypothesis was that significant variability existed in spine trauma practices and was related to a lack of strong scientific evidence about spine trauma care.

2. Methods

We performed a cross-sectional study to evaluate the clinical practices of spine surgeons in France. We used a fictitious spine...
trauma vignette based on a real patient, a 31-year-old male with a Magerl type A.3.1 (AOSpine A3) fracture of L1 who presented with paraesthesia in both thighs but no other neurological deficits (Fig. 1). Transverse and sagittal computed tomography (CT) views were provided to illustrate the case (Fig. 2).

To define appropriate questions for this clinical vignette, we asked five experienced spine surgeons (GL, CD, NL, MG, and AD) to suggest five questions each. The questions had to be related to a specific aspect of spine trauma management, from admission to long-term follow-up. The surgeons were asked to draw on their own clinical practice to design questions for which they would like to know the viewpoints of their colleagues. Because of similarities among the 25 submitted questions, we selected 14 questions to simplify the questionnaire. These 14 questions are listed in Appendix 1 (e-component 1).

Each question had a 5-point answer scale that ranged from being sure that the procedure designated in the question should be performed to being sure that it should not be performed. The five answer options were “Yes, definitely”, “Yes, probably”, “I don’t know”, “No, probably not”, and “No, definitely not”. We tested the questionnaire on a panel of five experienced surgeons.

A surgeon-specific questionnaire appended to the 14-question survey was designed to collect information on the surgeons, including age, gender, experience level, professional status, and number of spine fractures treated yearly. The information on these items allowed us to look for factors affecting the survey answers.

This 31-year-old male with height 1 m 82, weight 78 Kg, and an unremarkable medical history was taken by the fire squadron to your centre around midnight after he sustained a spinal injury in a traffic accident. At arrival, he was conscious and oriented but reported pain, as well as paraesthesia in both lower limbs. Motor and sphincter function was normal.

Fig. 1. Clinical vignette (fictional case, public image).

Fig. 2. Computed tomography images in the clinical vignette.
An invitation to participate in the survey was sent by e-mail to 405 French surgeons involved in spine surgery. To improve the response rate of this electronic survey, we adopted recommended techniques such as providing a short explanation, using the word “survey” in the subject line of the email, having a white background, sending out a survey reminder after 1 month, and offering a reward if the survey was completed [8].

2.1. Statistical analysis

The Index of Qualitative Variation (IQV) was used to evaluate the degree of variability within answers to a given question [9]. The IQV is based on the ratio of the number of differences in the sample and the maximum possible number of differences. The IQV can range from 0 to 1, with 0 indicating no variability and 1 maximal variability (Fig. 3).

To identify factors influencing the observed differences, we specifically focussed on questions with very high variability (IQV > 0.90). First, the survey answers were recoded as a binary variable (0/1) by assigning a value of 1 to the answers “Yes, definitely” and “Yes, probably” and a value of 0 to the answers “I don’t know”, “No, probably not”, and “No, definitely not”. Then for each question, we looked for factors affecting the answers among the following surgeon-specific factors: age (related to experience level), speciality, type of centre (university-affiliated or not), and surgery volume (more or less than 50 fractures per year). Values of $P < 0.05$ were considered statistically significant. All statistical analyses were carried out using the free software R (http://www.R-project.org, The R Foundation for Statistical Computing, Vienna, Austria).

3. Results

Of the 405 surgeons invited to participate, 200 (49%), from 52 French cities, returned the completed survey and questionnaire (Table 1). There were 183 men and 17 women, with an mean age of $42 \pm 11$ years (range: 26–77); 110 respondents were orthopaedic surgeons and 90 neurosurgeons. Most of the respondents ($n = 132$) practised in the public sector, and 25% treated fewer than 10 spine fracture cases per year. There were 36 residents and 86 senior surgeons with more than 10 years' experience.

None of the survey questions consistently received the same answer. Five questions had very high variability (IQV > 0.90), seven high variability (0.90 > IQV > 0.50), and two lower variability (IQV < 0.50). The five questions with the highest variability were about the need for emergency MRI (IQV = 0.93), emergency surgery (IQV = 0.93), fusion (IQV = 0.92), a post-operative back brace (IQV = 0.91), and routine instrumentation removal in asymptomatic patients (IQV = 0.94) (Fig. 4).

The two questions with the lowest variability were about the need for surgery and the initial use of a posterior approach (Fig. 5). Nearly 99% ($n = 197$) of respondents stated they would perform surgery. However, as 32 of them were not absolutely sure that surgery was needed, there was some statistical variability (IQV = 0.42). Similarly, 97% of respondents would initially operate through a posterior approach, and 84% of them were sure this was the appropriate course of action (IQV = 0.36). The seven other questions showed significant variability, with IQVs between 0.80 and 0.90. Appendix 2 (e-component 2) details the answers.

Table 2 lists the factors affecting the surgeon practices. Neurosurgeons were more likely to request an MRI, younger surgeons to operate at night, and orthopaedic surgeons to consider post-operative bracing unnecessary. Conversely, none of the studied factors significantly affected answers about the need for routine instrumentation removal.

4. Discussion

Our cross-sectional study of 200 French surgeons surveyed about the management of a typical spine trauma case showed significant variability in clinical practices. Of the 14 questions, only two had low variability in their answers (IQV < 0.5). All other questions were highly controversial. We found that surgeon age, speciality, type of centre, and case volume influenced the answers. To further explore our findings, we reviewed the literature on the five questions showing the greatest variability.

![Fig. 3. Examples of IQV variability with five response options.](image-url)
MRI is the key imaging modality to assess soft tissues. In patients with spine trauma, MRI helps to assess disc and ligament integrity and to identify spinal cord injuries and their severity [10]. MRI can lead to a stable fracture being reclassified as unstable [11,12]. A study by Winklhofer et al. [13] showed that adding MRI to CT increased the number of detected fractures by 18%, changed the ThoracoLumbar Injury Severity Score (TLISS) in 30% of cases, and increased by 24% the number of patients with identified injuries requiring surgical stabilisation. On the other hand, the greater sensitivity of MRI for detecting injuries might increase the risk of operating on patients who do not have unstable injuries.
MRI is also very valuable for assessing the spinal cord (for oedema, haematoma, and injury) and can therefore assist in establishing the neurological prognosis [14]. In our clinical vignette, the fracture was obvious and the need for surgery could be determined based solely on the TLISS [15]. Thus, MRI did not provide new information for establishing the diagnosis or choosing the treatment. Instead, the possible contribution of MRI was to help determine the prognosis.

4.2. Degree of urgency

The optimal timing of surgery for spine injuries with neurological compromise is debated. Several studies compared outcomes after immediate or delayed surgery [16–19]. However, their considerable heterogeneity hinders attempts at synthesising their findings. The definition of “early surgery” varied but usually involved surgery 24 to 72 hours after the injury. Some studies used even broader definitions (e.g., 8–100 hours) [20,21]. A recent meta-analysis used a rigorous methodology to extensively review the existing data [22]. The results showed that early surgery improved the outcomes in terms of neurological recovery and length of hospital stay. However, the results of the studies included in the meta-analysis were not very robust, and the authors therefore cautioned about possible analytical bias.

In our fictional case, a major issue was the severity of the neurological compromise. Some surgeons believe that an isolated sensory deficit does not require emergent management and therefore do not advocate emergent surgery for cases such as the one used for our survey. However, isolated sensory deficits are categorised as incomplete neurological injuries in the TLISS classification and therefore affect the acceptable surgical delay (3 points in the classification system) [15]. When considering the urgency of the case, the next question is whether surgery should be performed even at night. If for technical reasons, surgery cannot be performed on the next day while remaining within the 24 hour time frame, surgery at night seems preferable.

4.3. Fusion

Our survey revealed considerable uncertainty regarding the role for fusion via bone grafting compared to instrumentation without attempted fusion. Two fairly recent randomised controlled trials comparing instrumentation with grafting versus no grafting showed similar results [23,24]. After 24 months, maintenance of correction was not significantly different with versus without bone grafting. However, the bone-graft groups had longer operative times, greater blood loss, and longer hospital stays. At a recent SFCR round-table meeting on spinal fractures, it was suggested that most of the correction loss occurs within the first 3 months after surgery. Instrumentation failure and loss of correction may often occur immediately upon weight bearing, when grafting cannot yet have a protective effect. The results of these two level-1 studies probably explain that the surgeons in our study felt bone grafting was inappropriate when performing posterior instrumentation. Conversely, the role for anterior instrumentation and for post-operative bracing remains unclear.

4.4. Post-operative bracing

We are not aware of any published data on the effectiveness of post-operative bracing after spine fractures. As suggested above, a brace might contribute to maintain the correction during the first few months. Since no studies on this topic are available, we cannot provide any guidance on the need for post-operative bracing.

4.5. Routine instrumentation removal

If the instrumentation causes discomfort or pain, removing it may provide relief. In a study by Stavidris et al., although only

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**Table 2**

Factors associated with the answers to the five questions showing the greatest variability (statistically significant associations are in bold type).

<table>
<thead>
<tr>
<th>Factors questions</th>
<th>Age</th>
<th>Speciality</th>
<th>Type of centre</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>No 1: emergent MRI</td>
<td>P=0.001</td>
<td>P=0.08</td>
<td>P=0.19</td>
<td>P=0.2</td>
</tr>
<tr>
<td>No 3: emergency surgery</td>
<td>P=0.001</td>
<td>P=0.15</td>
<td>P=0.001</td>
<td>P=0.08</td>
</tr>
<tr>
<td>No 8: bone grafting</td>
<td>P=0.05</td>
<td>P=0.35</td>
<td>P=0.14</td>
<td>P=0.02</td>
</tr>
<tr>
<td>No 10: post-operative brace</td>
<td>P&lt;0.001</td>
<td>P&lt;0.001</td>
<td>P&lt;0.001</td>
<td>P=0.03</td>
</tr>
<tr>
<td>No 12: routine removal of material</td>
<td>P=0.68</td>
<td>P=0.85</td>
<td>P=0.45</td>
<td>P=0.19</td>
</tr>
</tbody>
</table>
12% of patients reported complete resolution of pain or discomfort after instrumentation removal, more than 60% said they would undergo the same procedure again [25]. The need for instrumentation removal is also an important issue in asymptomatic patients. A recent study showed that the discs above and below a vertebral compression fracture did not consistently develop degenerative lesions [26]. If the segments locked in by the instrumentation do not require stabilization, instrumentation removal may be warranted, although it is difficult to justify a new surgical procedure in an asymptomatic patient. In addition, allowing the non-injured discs to move again might initiate a new episode of pain. Given the absence of conclusive data from published studies, we cannot provide guidance regarding the need for routine instrumentation removal.

5. Conclusion

There was significant variability in spine trauma practices in France in 2013. Clinical practices were influenced chiefly by surgeon specialty, age, and experience and by type of surgical centre. Most of the variability is probably ascribable to the lack of high-quality published scientific evidence. Our survey identified aspects of spine trauma care for which no clear answers are available. These findings will help us to define research priorities for the coming years.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

Appendix 1 and 2. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.otsr.2014.10.018.

References