WORKSHOPS OF THE SOO (2012, NANTES). ORIGINAL ARTICLE

Surgical management of rotator cuff tears in adults: Prospective study of 50 consecutive patients and professional practice self-assessment

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KEYWORDS
Rotator cuff tears; National clinical practice guidelines; Self-assessment of professional practices

Summary
Introduction: As part of quality-improvement efforts, we self-assessed our professional practices regarding the surgical management of rotator cuff tears comparatively to recommendations issued by the French National Authority for Health (HAS).

Material and methods: An independent observer prospectively evaluated 50 consecutive patients with rotator cuff tears treated surgically over a 1-year period. For each patient, we identified divergences with the 20 relevant HAS recommendations.

Results: Initially, 54% of practices were found to diverge from HAS recommendations, 10% regarding the preoperative work-up, 14% the duration of initial medical treatment, and 30% the nature of the surgical procedure.

Discussion: A review of the data showed that 26% of practices diverged from recommendations, 10% regarding the preoperative work-up, 2% the duration of initial medical treatment, and 14% the nature of the surgical procedure. Overall, for the 26% of divergent practices, 10% were related to judgement or evaluation errors and 16% to a deliberate and substantiated decision made by the surgeons.

Conclusion: The clinical practice guidelines issued by the HAS, although useful and necessary, were shown by our study to exhibit a number of limitations. Thus, our data illustrate the complexity of surgical management decisions.

Level of evidence: Level IV (cases series).

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Introduction

"Professional practice evaluation is a powerful movement that is limited neither to France nor to the healthcare sector."

The goal is improved quality, and the legitimate demands of healthcare system users and managers must be met.” (French National Authority for Health, Haute Autorité de santé [HAS], 2007). To comply with this recommendation, we self-evaluated our professional practices at the orthopaedic surgery department of the Tours University Hospital, Tours, France. This effort was intended to improve quality of care and to self-assess our performance [1–4] as part of broader evaluation studies on the management of shoulder injuries.

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http://dx.doi.org/10.1016/j.otsr.2013.03.005

Please cite this article in press as: Williot A, Favard L. Surgical management of rotator cuff tears in adults: Prospective study of 50 consecutive patients and professional practice self-assessment. Orthopaedics & Traumatology: Surgery & Research (2013), http://dx.doi.org/10.1016/j.otsr.2013.03.005
requirements regarding the credentialing of physicians and accreditation of healthcare facilities, in compliance with current regulations [5,6].

Our self-assessment involved a prospective longitudinal 1-year study of 50 consecutive patients treated surgically in our department for rotator cuff tears. We compared the management of these patients to the 20 relevant HAS recommendations in two sets of guidelines, “Management of chronic shoulder pain without instability in adults” [7] and “Surgical management of rotator cuff tears in adults” [8] and we determined whether our practices complied with each recommendation.

Material and methods

Study design

All 50 consecutive patients treated surgically for documented rotator cuff tears between January 2010 and January 2011 were included. Clinical and radiological data were collected prospectively by an independent observer. Then, compliance with each of the 20 HAS recommendations [7,8] was assessed. These 20 recommendations pertained to the clinical examination, first- and second-line investigations, role and duration of medical treatment, modalities of surgical treatment, and use of rehabilitation therapy.

Patients and imaging studies

The 50 patients included 31 (62%) women and 19 (38%) men with a mean age at surgery of 63.6 years (range, 40.6–84.3 years). Surgery was performed on the dominant side in 36 (72%) of cases. The cause of the rotator cuff tear was degenerative disease in 32 (64%) patients, trauma in nine (18%), degenerative disease with a history of trauma in eight (16%), and failure of surgical repair with a recurrent tear in one (2%). Mean symptom duration was 36.3 months (range, 2–420 months).

All patients received initial medical therapy, which consisted of oral medications in 48 patients, local corticosteroid injections in 28 patients, and physical therapy in 30 patients.

In all patients, the first-line preoperative work-up consisted of standard radiographs with anteroposterior views of the shoulder in internal, neutral, and external rotation and a lateral rotator cuff view (Fig. 1). In addition, ultrasonography was performed in two patients (Fig. 2).

Second-line imaging studies consisted of computed tomography (CT)-arthrography in 31 (62%) patients (Figs. 3 and 4), magnetic resonance imaging (MRI) in 10 (20%) patients (Fig. 5), MRI and CT-arthrography in four (8%) patients, and CT without contrast-agent injection in four (8%) patients. No second-line imaging studies were done in the remaining patient (2%).

Rotator cuff tears

Of the 50 patients, five (10%) had partial-thickness tears [9] of the supraspinatus tendon, located at the deep aspect in four cases and superficial aspect in one case. All five tears were stage III in the Ellman classification system [10] (Fig. 6).

The remaining 45 (95%) patients had full-thickness tears. Fatty degeneration of the four rotator cuff muscles evaluated using the Bernageau and Goutallier classification system [11] was stage 0 in 16% of cases, stage 1 in 24%, stage 2 in 22.6%, stage 3 in 12%, and stage 4 in 25.4%.

Supraspinatus muscle retraction evaluated using the Bernageau classification system [12] was stage I or “distal” in 25% of cases, stage II or “intermediate” in 29.5%, and stage III or “retracted” in 45.5%.

The intraoperative assessment showed massive tears (>5 cm²) [13] in 36% of cases.

Surgical procedures

A reconstructive procedure was performed in 35 cases (70%) and a non-reconstructive procedure in eight (16%) cases. Shoulder arthroplasty was performed in the remaining seven (14%) cases.

Of the 35 cuff repairs, 30 (86%) were tension-free and 5 (10%) involved tension. Arthroscopic surgery was used in 28 cases, open surgery in five cases, and arthroscopy combined with a minimally invasive approach in two cases.

The seven shoulder arthroplasties consisted in the implantation of the reversed shoulder prosthesis Aequalis®

Figure 1  Standard anteroposterior radiographs of the shoulder in internal, neutral, and external rotation.
The latissimus dorsi was transferred in one case [15] and the bony increased-offset reverse shoulder prosthesis (BIO-RSA) method described by Boileau et al. [16] was used in four cases.

Of the 50 procedures, 14 (28%) were performed by junior surgeons and 36 (72%) by senior surgeons specialised in shoulder surgery.

Postoperatively, 38 (76%) patients received treatment in a rehabilitation centre.

Results
The initial comparison of our professional practices to the HAS recommendations showed divergences in 54% of cases.
Regarding the clinical evaluation, all patients were seen by their surgeon, who consistently obtained a medical history then performed a physical examination including inspection, clinical palpation, passive and active range-of-motion evaluations, and cuff tests: 0% divergence rate.

Regarding first-line investigations, all patients underwent standard radiography with anteroposterior views in internal, neutral, and external rotation and a lateral cuff view (ultrasonography was performed also in two patients): 0% divergence rate.

Regarding second-line investigations, ultrasonography,arthrography alone, and CT without contrast-agent injection are considered inadequate in the HAS recommendations. Of our 50 patients, four (8%) had CT without contrast-agent injection as the only second-line investigation and one (2%) had no second-line investigations on the operated side: 10% divergence rate.

Regarding the role and duration of first-line medical therapy, all patients received medical treatment initially. However, the duration of first-line medical therapy was less than the recommended 6 months in 7 (14%) patients: 14% divergence rate.

All five partial-thickness tears were repaired using a strictly arthroscopic technique. However, in one (2%) patient with a tear involving more than 50% of the tendon thickness, simple debridement without tendon repair was performed: 2% divergence rate.

Regarding surgical repair of full-thickness tears, all three methods (open surgery, minimally invasive surgery, and arthroscopic surgery) were used in compliance with HAS recommendations. All patients managed with surgical repair were active and motivated individuals whose rotator cuff muscles were in good condition (fatty degeneration score ≤ 2). However, shoulder stiffness was noted on the day of surgery in six (12%) patients, and tension of the cuff repair was noted intraoperatively in five (10%) patients: 22% divergence rate.

Regarding the non-reconstructive procedures, in contradiction to HAS recommendations, 2 (4%) patients underwent open debridement instead of arthroscopic debridement: 4% divergence rate.

Regarding shoulder arthroplasty, all seven patients had one of the two recognised indications, i.e., shoulder pseudoparalysis due to a massive cuff tear (2%) (Fig. 8) or cuff-tear arthropathy (12%) [17] (Fig. 9). However, one (2%) of these patients was 52.8 years of age, i.e., younger than the cut-off recommended by the HAS for shoulder arthroplasty: 2% divergence rate.

All 50 patients received postoperative rehabilitation therapy, which was delivered in a rehabilitation centre in 76% of cases: 0% divergence rate.

Table 1 recapitulates these data.
Discussion

The French National Authority for Health (HAS) was created by the health insurance reform law passed on 13 August 2004 [18]. The HAS is an independent public institution that relies on scientific expertise to develop guidelines for healthcare resource utilisation and clinical practice. We used two of the HAS clinical practice guideline sets [7,8] as the reference for a self-assessment of our professional practice regarding the surgical management of rotator cuff tears. Our objective was to improve quality of care while complying with specific regulations [1—4] relevant to the accreditation of healthcare facilities and credentialing of physicians [5,6].

The initial analysis of our results indicated divergences with HAS recommendations for 54% of our professional practices. We then performed a detailed analysis of these divergent practices:

- second-line imaging studies:
  - 10% divergence rate in the initial analysis.

Table 1  Compliance and non-compliance of our professional practices with HAS recommendations, according to the initial analysis (%).

<table>
<thead>
<tr>
<th></th>
<th>Compliance (%)</th>
<th>Non-compliance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clinical evaluation</strong></td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Investigations</td>
<td>90</td>
<td>10</td>
</tr>
<tr>
<td>First line</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Second line</td>
<td>90</td>
<td>10</td>
</tr>
<tr>
<td><strong>Medical treatment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Role</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Duration</td>
<td>86</td>
<td>14</td>
</tr>
<tr>
<td><strong>Surgery</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>96 Non-reconstructive</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Reconstructive</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partial tears</td>
<td>98</td>
<td>2</td>
</tr>
<tr>
<td>Full-thickness tears</td>
<td>78</td>
<td>22</td>
</tr>
<tr>
<td>Shoulder arthroplasty</td>
<td>98</td>
<td>2</td>
</tr>
<tr>
<td><strong>Rehabilitation</strong></td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>46</td>
<td>54</td>
</tr>
</tbody>
</table>

All four (8%) patients who underwent CT without contrast-agent injection were being considered for shoulder arthroplasty. As the main objective of the investigation was to assess the bones and not the tendons, the surgeon requested CT without contrast-agent injection (Fig. 10). Nevertheless, these four cases do not comply with HAS recommendations.

No second-line imaging investigations were obtained in one (2%) patient, because a last-minute decision was made to treat the contralateral shoulder, where the symptoms had become more severe than on the initially evaluated side. The cuff was successfully repaired. This divergence from the HAS recommendations was a one-off event in our case-series,

- role and duration of first-line medical treatment:
  - 14% divergence rate in the initial analysis.

In seven (14%) patients, the duration of first-line medical treatment was less than 6 months, in contradiction to HAS recommendations. Of these seven patients, five (5/50, 10%) had post-traumatic tears and one (1/50, 2%) had degenerative disease with a history of trauma. Tears due to trauma or occurring after a history of trauma are not covered by the HAS recommendations (which refer only to degenerative tears). Published studies [19—21] increasingly advocate very early treatment of post-traumatic tears in an effort to improve postoperative outcomes,

- partial-thickness tears:
  - 2% divergence rate in the initial analysis.

The HAS recommends repairing all lesions that involve more than 50% of the tendon thickness, while specifying that “this recommendation is not universally accepted by all the professionals surveyed”, a
fact that is consistent with several published studies [21–24]. Nevertheless, the management by simple debridement of one (2%) patient with a greater than 50% partial-thickness tear is not in compliance with the HAS recommendation,

- 2% divergence rate in the second analysis;
  - full-thickness tears:
    - 22% divergence rate in the initial analysis.
      Of the six (12%) patients with shoulder stiffness on the day of surgery, only one (2%) had a degenerative tear and therefore constituted a failure to comply with the HAS recommendations.
      Of the five (10%) patients who underwent cuff repair and for whom tension of the suture was noted intraoperatively, only (4%) had degenerative tears and therefore constituted failures to comply with the HAS recommendations. It has been suggested that even incomplete repair with tension may be preferable over absence of repair [25],
    - 6% divergence rate in the second analysis;
    - non-reconstructive surgery or debridement:
      - 4% divergence rate in the initial analysis.
      In the two (4%) patients managed with open debridement instead of arthroscopic debridement, the surgeon found that the initially planned repair procedure was not feasible,
      - 4% divergence rate in the second analysis;
    - shoulder arthroplasty:

Table 2  Divergences with HAS recommendations according to the first and second analyses, with cases due to substantiated decisions and cases due to unsubstantiated decisions or errors (%).

<table>
<thead>
<tr>
<th></th>
<th>Non-compliance 1st analysis (%)</th>
<th>Non-compliance 2nd analysis (%)</th>
<th>Substantiated decision (%)</th>
<th>Unsubstantiated/Error (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical evaluation</td>
<td>0</td>
<td>0</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Investigations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First line</td>
<td>0</td>
<td>0</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Second line</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Medical treatment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Role</td>
<td>0</td>
<td>0</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Duration</td>
<td>14</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Surgery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reconstructive</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partial tears</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Full-thickness tears</td>
<td>22</td>
<td>6</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Non-reconstructive</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Shoulder arthroplasty</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>0</td>
<td>0</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Total</td>
<td>54</td>
<td>26</td>
<td>16</td>
<td>10</td>
</tr>
</tbody>
</table>

Figure 10  Example of computed tomography without contrast injection performed as part of the work-up before reverse shoulder arthroplasty.
2% divergence rate in the initial analysis.

One of the patients managed by shoulder arthroplasty was 52.8 years of age. However, published data indicate that reverse shoulder arthroplasty may constitute the only treatment option in some patients, regardless of age [26–28]. Nevertheless, this case was classified as failing to comply with the HAS recommendations,

2% divergence rate in the second analysis.

This second analysis of our results indicated that the rate of divergence with HAS recommendations was 26%. In 16% of cases, failure to comply was a deliberate decision made by the surgeon, who specified the reasons underlying the decision. The remaining 10% of cases were due to errors or to unsubstantiated decisions. Table 2 recapitulates these data.

Relative to the number of operated patients, the rate of divergence with the HAS recommendations was 25% for senior surgeons specialised in the shoulder and 28.5% for junior surgeons. The proportion of divergences that were the result of substantiated decisions was 2/3 among senior surgeons and 1/2 among junior surgeons.

Conclusion

In our case-series, the rate of divergence with HAS recommendations was 26%. In 10% of cases, failure to comply with the recommendations was an involuntary event related to an error in judgement, inadequate evaluation of the case, or suboptimal organisation of care. These events should be prevented by a change in practices based on increased punctiliousness, with the goal of improving quality of care. In the remaining 16% of cases, non-compliance with the recommendations reflected deliberate decisions made by the surgeons. These decisions rest on personal experience, professional practice, and knowledge of the most recent medical literature.

Thus, although the HAS recommendations are necessary and useful as tools to improve quality of care, they have a number of limitations. These limitations are probably related in part to the difficulty of charting a single course of conduct appropriate for navigating the vast and complex field of surgical practice.

Disclosure of interest

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

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Please cite this article in press as: Williot A, Favard L. Surgical management of rotator cuff tears in adults: Prospective study of 50 consecutive patients and professional practice self-assessment. Orthopaedics & Traumatology: Surgery & Research (2013), http://dx.doi.org/10.1016/j.otsr.2013.03.005