Does this woman have adnexal torsion?

Cyrille Huchon1,2,3,*, Pierre Panel4, Gilles Kayem2,5, Thomas Schmitz3,6, Thuy Nguyen7, and Arnaud Fauconnier1,2

1Department of Gynecology and Obstetrics, CHI Poissy Saint-Germain en Laye, Poissy, France 2INSERM, UMR 953, Epidemiological Research Unit on Perinatal Health and Women’s and Children’s Health, Hôpital Cochin, F-75014 Paris, France 3University Paris V, René Descartes, Paris, France 4Department of Gynecology and Obstetrics, CHI Versailles A. Mignot, Versailles, France 5Department of Obstetrics and Gynecology, CHI Créteil, France 6Maternité Port-Royal, Hôpital Cochin-Saint Vincent de Paul, AP-HP, Paris, France 7Department of Obstetrics and Gynecology, Hôpital Louis Mourier, AP-HP, Colombes, France

*Correspondence address. Service de Gynécologie, Obstétrique et Médecine de la Reproduction, CHI Poissy Saint-Germain en Laye, 10 rue du champ Gaillard, 78103, Poissy, France. Tel: +33-1-39-27-45-77; Fax: +33-1-39-27-44-12; E-mail: cyrillehuchon@yahoo.fr

Submitted on November 20, 2011; resubmitted on March 6, 2012; accepted on April 27, 2012

BACKGROUND: No questionnaire is currently available for the presurgical diagnosis of adnexal torsion (AT). Our objective was to develop a predictive model for AT, based on the Self Assessment Questionnaire for Gynecologic Emergencies (SAQ-GE) designed for triaging women with acute pelvic pain.

METHODS: We performed a multicenter prospective trial conducted in five hospitals in France. Four hundred and ninety-six (496) women with acute pelvic pain (Numeric Rating Scale >4), including 31 with AT, were recruited from September 2006 through April 2008. An AT score was built using the SAQ-GE.

RESULTS: Five criteria were independently associated with AT confirmed by surgery: unilateral lumbar or abdominal pain (adjusted diagnostic odds ratio (aDOR), 23.3; 95% confidence interval (95% CI), 3.0–178); absence of leucorrhoea and metrorrhagia (aDOR, 7.0; 95% CI, 2.5–20), ovarian pain (aDOR, 5.5; 95% CI, 1.5–21), unbearable pain (aDOR, 5.0; 95% CI, 1.4–18) and vomiting (aDOR, 3.7; 95% CI, 1.6–9.0). The SAQ-GE torsion score was based on these five criteria and its values range from 0 to 10. The low-risk group (SAQ-GE torsion score <7), based on the score values, has a sensitivity (Se) of 96.7% (95% CI, 90.5–100), a negative predictive value of 99.7% (95% CI, 99.1–100) and a negative likelihood ratio (Lr−) of 0.05, ruling out AT with a probability of AT of 0.3% (95% CI, 0.0–0.9). Cross-validation of the model was performed using the jackknife resampling procedure, retrieving an unbiased Se of 87.1 (95% CI, 75.1–99.1) and a specificity of 74.2% (95% CI, 70.2–78.2).

CONCLUSIONS: The SAQ-GE torsion score may prove useful for screening for AT in patients experiencing acute pelvic pain.

Key words: acute pelvic pain / gynecologic emergency / adnexal torsion / clinical prediction rule / jackknife procedure / qualitative study

Introduction

Acute pelvic pain in women is the leading reason for emergency visits to gynecology or emergency department (EDs) (Kontoravdis et al., 1996). In these patients, diagnosing adnexal torsion (AT) is a clinical dilemma. AT is suspected preoperatively in only 23–66% of the cases of AT, while on the other hand, half of the patients undergoing surgery for a suspicion of AT have a different disease diagnosed during the surgical procedure (Huchon and Fauconnier, 2010). Delayed diagnosis of AT can lead to adnexal loss by necrosis (Bayer and Wiskind, 1994), life-threatening events due to thrombophlebitis or peritonitis (Nichols and Julian, 1985), and even death in childhood (Havlik and Nolte, 2002; Fitzhugh et al., 2008) if surgery is not performed in time.

Triage is a major issue in the ED and is necessary to identify which patients should be given priority care in a crowded ED, in order to reduce excessive delay before treatment for patients who need to be treated as quickly as possible (Elshove-Bolik et al., 2007). Triage scales have already been developed (Farrokhnia et al., 2011), mainly based on patients’ vital signs. Questioning is not usually used for triaging patients suffering from acute pelvic pain, and the literature focuses on sophisticated tests (Singh et al., 2009). Scores for diagnosing the origin of abdominal pain using the patient’s history associated with physical examination and complementary tests have already been developed (Alvarado, 1986; Samuel, 2002) and the patient’s history has also been suggested as contributing partially to the diagnosis of AT by the physician (Huchon et al., 2010). However, items of history taking in these scores are collected by the physician, are liable to be misinterpreted and are not based on a standardized questionnaire directly comprehensible for patients. Our team has developed a standardized questionnaire of this kind dedicated to...
gynecologic emergencies, which has proven its usefulness for tubal rupture in ectopic pregnancy (Huchon et al., 2012).

This prospective study was designed to construct a prediction rule to rule out AT among patients experiencing acute pelvic pain, by standardized and fine analysis of the painful semiology using this Self Assessment Questionnaire dedicated to Gynecologic Emergencies (SAQ-GE).

Materials and Methods

Self Assessment Questionnaire for Gynecologic Emergencies

Our team has developed a SAQ-GE (Huchon et al., 2012). The SAQ-GE is an 89-item questionnaire divided into six themes: (i) qualitative description of pain, (ii) intensity of pain, (iii) location and (iv) evolution of pain, (v) vaginal bleeding and (vi) associated signs.

This SAQ-GE was constructed using semi-structured interviews in 2003 with 39 patients at the Poissy-Saint Germain en Laye Hospital, who were subsequently diagnosed with gynecologic emergencies, including 5 AT (Huchon et al., 2012). An adaptation of Colaizzi’s method (Colaizzi, 1978) was used for a qualitative assessment of the semi-structured interview.

The SAQ-GE was finally built with items identified from the semi-structured interviews and that were: (i) often associated with potentially life-threatening gynecologic emergencies; and/or (ii) specific of potentially life-threatening gynecologic emergencies; and/or (iii) given high ratings by French experts identified by searching Medline for publications on gynecologic emergencies. To make the questionnaire easy to understand by the patients, we worded the items using the phrases and sentences collected from the semi-structured interviews.

Derivation of the SAQ-GE torsion score

Participants

From September 2006 to April 2008, we asked all patients presenting at the study-center’s gynecologic EDs for acute pelvic pain to complete the SAQ-GE on a voluntary basis. In France, the diagnosis of acute pelvic pain may take place in general EDs, followed by referral to a gynecologic ED, or directly in gynecologic EDs to which all patients have free access. So, all patients presenting gynecologic emergencies are seen in gynecologic EDs.

The patients were enrolled at five gynecology departments in the Greater Paris metropolitan region, France. Four departments were in teaching hospitals (Poissy-Saint Germain en Laye, Créteil, Port-Royal and Louis Mourier) and one was in a general hospital (Versailles). All these gynecologic EDs have a resident and a senior gynecologist on duty 24 h a day with night and day access to ultrasonography and operative rooms. They also have appropriate written pain management guidelines and a specific interest in gynecologic emergencies.

The SAQ-GE was completed by patients themselves after appropriate initial pain management and before any surgery. The nurses then collected the completed questionnaires.

Exclusion criteria were a history of chronic pelvic pain, neurologic or psychiatric disease, hemodynamic instability and no knowledge of French. Patients with a verbal numeric pain rating scale (NRS) <4 on an 11-point rating scale and with Bartholinitis were excluded from the study.

The study was approved by the French Department of Higher Education and Research (no. 06.336) and by the French National Committee of Information Technology and Individual Liberties (no. 906253).

Diagnosis of AT

The reference standard for the diagnosis of AT was the laparoscopic diagnosis. AT was defined as the twisting of the adnexa, ovary or tube alone by at least one complete turn, around a center-line consisting of the infundibulopelvic ligament and tubo-ovarian ligament.

Patients who did not have a laparoscopy were classified as not having AT. Diagnoses of other diseases were obtained by the various investigations performed in EDs or during hospitalization: clinical examination and/or ultrasonography and/or computed tomographic scan. Some diagnoses were made by surgery: laparoscopy, dilatation and curettage or diagnostic hysteroscopy. Ectopic pregnancy was diagnosed by either surgery or an algorithm (Mol et al., 1999). Diagnosis of pelvic infectious disease was also made by surgery, if needed, or by a non-invasive prediction rule (Kahn et al., 1991). Uncertain initial diagnoses not requiring immediate emergency care, such as early pregnancy of uncertain location, were reconvened in the early pregnancy clinic until diagnostic certainty (Bignardi et al., 2010). When a patient was discharged from a gynecologic ED, she was advised to refer again if the pain continued or started again.

Statistical methods

The required sample size was estimated as follows. Based on the appropriate selection of several items of the SAQ-GE, we expected to be able to derive a prediction rule for preoperative AT screening. To rule out AT, our analysis had to focus on sensitivity (Se) (Loong, 2003). To be of clinical interest, the rule has to achieve at least 95% Se (Jaeschke et al., 1994). Inversely, we would conclude that the questionnaire is inefficient if we were not able to derive any model with a Se over 80%. On a pragmatic basis, type III errors (Schwartz and Lellouch, 2009) were taken into consideration in order to determine the required sample size. The first type III error is defined here as the probability that the observed Se exceeds 95% while the true Se is equal or below 80%. The second type III error is defined as the probability that the observed Se is below 80% while the true Se is equal or above 95%. If the observed Se for the diagnosis of AT by the SAQ-GE is between 80 and 95%, further investigations would be necessary to assess its exact value for the preoperative diagnosis of AT. Based on the binomial distribution, we calculated that the inclusion of 30 patients with AT would guarantee that both type III errors are below 0.025 (one-sided).

The prediction rule was derived as follows: first we compared the patients with and without AT according to their answers to questionnaire items, using Pearson’s 2 test or Fisher’s exact test. For each variable that was significantly associated with AT at a threshold of P < 0.05, we computed Se, specificity (Sp), positive likelihood ratio (Lr+), negative likelihood ratio (Lr−) and crude diagnostic odds ratio.

We then used multiple logistic regression analysis to select the best combination of variables for predicting AT among variables with P-values below 0.05 in the bivariate analyses. We identified the best combinations of variables independently associated with AT at a threshold of P < 0.05. Adjusted diagnostic odds ratios (aDOR) were computed with their 95% confidence intervals (95% CI).

Finally, the SAQ-GE torsion score was based on items found to be significant by multivariate analysis. Missing data were considered as absent. The number of torsion score points contributed by each score item was obtained by rounding up the β coefficients of the logistic regression to generate a simple scale. The area under the receiver operating characteristic curve (ROC-AUC) of the SAQ-GE torsion score was then compared with the ROC-AUC of the logistic regression to check that the two values were not significantly different. The probability of AT, Se, Sp, Lr+, Lr−, positive predictive value (PPV) and negative predictive value (NPV) were calculated for different SAQ-GE torsion score values.
Risk groups for AT were then constructed by cut-offs for the SAQ-GE torsion score, selected using the ROC curve, in order to maximize classification rates using the expected value of Se > 95%. Diagnostic values (Se, Sp, Lr+, Lr−, PPV and NPV) were also computed for non-pregnant patients.

The predictive ability of the derived model was then tested by cross-validation using the jackknife procedure (Efron and Gong, 1983). This method is especially useful for estimating the unbiased diagnostic performance of a model when no external validation population exists. The method was applied as follow: (i) the study population (N) was randomly stratified into 10 equivalent subgroups of N/10 (±1) women; (ii) for each subgroup (i), a new prediction model (Mi) was constructed with the entire study sample except those in subgroup (i); (iii) model Mi was then used to predict the outcome of the women omitted in constructing it. These steps were repeated for each subgroup.

Analyses were carried out using Stata® version 11.0 (Stata Corp., College Station, TX, USA).

**Results**

During the study period, 574 patients completed the SAQ-GE. Of these, 78 were excluded from the study, leaving 496 patients with 31 AT for analysis (Fig. 1). Their mean age was 32.0 years (± 8.2). Among the 496 patients included, 230 patients had a negative pregnancy test, including 26 with AT.

The diagnostic performance characteristics of the SAQ-GE items associated with AT in the bivariate analysis are shown in Table I. By multiple logistic regression analysis, five variables independently predicted the diagnosis of AT: ‘unilateral lumbar or abdominal pain’, ‘absence of leucorrhea and metrorrhagia’, ‘ovarian pain’, ‘unbearable pain’ and ‘vomiting’. aDOR with their 95% CI are reported in Table II. The ROC-AUC was 0.93 (95% CI, 0.89–0.97). For a 0.05 threshold of predicted probability of AT by the logistic regression model, Se was 96.7% (95% CI, 90.5–100) and Sp 70.5% (95% CI, 66.4–74.7).

The SAQ-GE torsion score was given by the following equation:

\[
\text{score} = \text{unilateral abdominal or lumbar pain} \times 3 + \text{absence of leucorrhea and metrorrhagia} \times 2 + \text{ovarian pain} \times 2 + \text{unbearable pain} \times 2 + \text{vomiting} \times 1.
\]

The probability of AT can be estimated using an appropriate logistic transformation:

\[
P = \frac{1}{1 + \exp(-0.98 \times \text{score} - 9.81)}.
\]

The score ROC curve is shown in Fig. 2. The rounded coefficients constituting the score are given in Table III. Loss of fit due to coefficient rounding was weak (ROC-AUC, 0.92; 95% CI, 0.88–0.95) and the ROC-AUC of the score was not significantly different from the ROC-AUC of the initial logistic regression model (P = 0.09).

The low-risk group comprised patients with SAQ-GE torsion scores ≤ 6, for whom the probability of AT was 0.3% (1/328; 95% CI, 0.0–0.9; Table III). With a cut-off value of 6, Se was 96.8% (95% CI, 90.5–100), NPV 99.7% (95% CI; 99.1–100) and Lr− 0.05. In non-pregnant patients, Se was 96.2% (95% CI, 88.6–100), Lr− 0.06, NPV was 99.3% (95% CI, 97.8–100) and the probability of AT was 0.7% (1/136; 95% CI, 0.1–1.2).

The high-risk group comprised patients with an SAQ-GE torsion score = 10, for whom the probability of AT (PPV) was 52.2% (12/23; 95% CI, 31.7–72.6; Table III). A cut-off value of 9 produced high Sp (97.7%, 95% CI, 96.3–99.9) and Lr+ (16.8) values. In non-pregnant patients, Sp was 96.6% (95% CI, 94.1–99.1), Lr+ was

---

**Figure 1** Flow chart for enrollment into SAQ-GE AT scale development study.
11.3 and the probability of AT (PPV) was 58.8% (10/17; 95% CI, 35.1–82.6).

Cross-validation of the model using the jackknife procedure showed that the logistic model was stable, retrieving the selected model as the best in 8 iterations out of 10. The jackknife resampling procedure retrieved an unbiased Se of 87.1% (95% CI, 75.1–99.1) and a Sp of 74.2% (95% CI, 70.2–78.2).

Discussion

We have developed here the first clinical prediction model for diagnosing AT among patients with acute pelvic pain, entirely based on a self-assessment questionnaire. Five simple Yes or No items predicted AT, namely: unilateral lumbar or abdominal pain, absence of leucorrhea and metrorrhagia, ovarian pain, unbearable pain and vomiting. The combination of these items into a score gave rise to a clinical decision rule with an Se of 96.7%, an NPV of 99.7% and an Lr² of 0.05, corresponding to the desired level and proving that the SAQ-GE is useful for easy triage of women consulting with acute pelvic pain. These results are stable in non-pregnant patients.

### Table I

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Total, n/N (%)</th>
<th>AT, n/N (%)</th>
<th>Other, n/N (%)</th>
<th>Se (%)</th>
<th>Sp (%)</th>
<th>Lr+</th>
<th>Lr−</th>
<th>DOR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Known ovarian cyst</td>
<td>119/454 (26.2)</td>
<td>17/29 (58.6)</td>
<td>102/425 (24.0)</td>
<td>58.6</td>
<td>76.0</td>
<td>2.4</td>
<td>0.54</td>
<td>4.50 (2.0–9.9)</td>
</tr>
<tr>
<td>Never experienced such pain before</td>
<td>239/480 (49.8)</td>
<td>24/31 (77.4)</td>
<td>215/449 (47.9)</td>
<td>77.4</td>
<td>52.1</td>
<td>1.6</td>
<td>0.43</td>
<td>3.7 (1.6–8.9)</td>
</tr>
<tr>
<td>Absence of effect of analgesics</td>
<td>211/462 (45.7)</td>
<td>21/31 (67.7)</td>
<td>190/431 (44.1)</td>
<td>67.7</td>
<td>55.9</td>
<td>1.5</td>
<td>0.58</td>
<td>2.7 (1.2–5.9)</td>
</tr>
<tr>
<td>Pain lasting &lt;8 h</td>
<td>124/379 (32.7)</td>
<td>19/30 (63.3)</td>
<td>105/349 (30.1)</td>
<td>63.3</td>
<td>69.9</td>
<td>2.1</td>
<td>0.53</td>
<td>4.0 (1.8–8.9)</td>
</tr>
<tr>
<td>Sudden onset of pain</td>
<td>252/477 (52.8)</td>
<td>22/31 (71.0)</td>
<td>230/461 (51.6)</td>
<td>71</td>
<td>48.4</td>
<td>1.4</td>
<td>0.6</td>
<td>2.3 (1.0–5.1)</td>
</tr>
<tr>
<td>Sudden aggravation of pain</td>
<td>177/472 (37.5)</td>
<td>18/31 (58.1)</td>
<td>159/441 (36.0)</td>
<td>58.1</td>
<td>64.0</td>
<td>1.6</td>
<td>0.65</td>
<td>2.5 (1.2–5.2)</td>
</tr>
<tr>
<td>Stomach pain</td>
<td>99/476 (20.8)</td>
<td>2/31 (6.5)</td>
<td>97/445 (21.8)</td>
<td>6.5</td>
<td>78.2</td>
<td>0.30</td>
<td>1.2</td>
<td>0.24 (0.06–1.0)</td>
</tr>
<tr>
<td>Ovarian pain</td>
<td>291/478 (60.9)</td>
<td>28/31 (90.3)</td>
<td>263/447 (58.8)</td>
<td>90.3</td>
<td>41.2</td>
<td>1.5</td>
<td>0.24</td>
<td>6.5 (1.9–22)</td>
</tr>
<tr>
<td>Uterine pain</td>
<td>237/477 (49.7)</td>
<td>8/31 (25.8)</td>
<td>229/461 (51.4)</td>
<td>25.8</td>
<td>48.6</td>
<td>0.50</td>
<td>1.5</td>
<td>0.33 (0.14–0.76)</td>
</tr>
<tr>
<td>Absence of leucorrhea and metrorrhagia</td>
<td>256/482 (53.1)</td>
<td>30/31 (96.8)</td>
<td>226/451 (50.1)</td>
<td>96.8</td>
<td>49.9</td>
<td>1.9</td>
<td>0.07</td>
<td>29.9 (3.8–233)</td>
</tr>
<tr>
<td>Ovarian pain</td>
<td>199/487 (40.9)</td>
<td>26/31 (83.9)</td>
<td>173/456 (37.9)</td>
<td>83.9</td>
<td>62.1</td>
<td>2.2</td>
<td>0.26</td>
<td>8.5 (3.1–23.2)</td>
</tr>
<tr>
<td>Nausea</td>
<td>258/485 (53.2)</td>
<td>26/31 (83.9)</td>
<td>232/451 (51.1)</td>
<td>83.9</td>
<td>48.9</td>
<td>1.6</td>
<td>0.33</td>
<td>5.0 (1.9–13)</td>
</tr>
<tr>
<td>Vomiting</td>
<td>125/486 (25.7)</td>
<td>19/31 (61.3)</td>
<td>106/455 (23.3)</td>
<td>61.3</td>
<td>76.7</td>
<td>2.6</td>
<td>0.50</td>
<td>5.2 (2.4–11)</td>
</tr>
<tr>
<td>Radiating pain</td>
<td>50/439 (11.4)</td>
<td>9/30 (30.0)</td>
<td>41/409 (10.0)</td>
<td>30</td>
<td>90</td>
<td>3</td>
<td>0.78</td>
<td>3.8 (1.6–9.1)</td>
</tr>
<tr>
<td>Torsion pain</td>
<td>114/470 (24.3)</td>
<td>19/31 (61.3)</td>
<td>95/431 (21.6)</td>
<td>61.3</td>
<td>78.4</td>
<td>2.8</td>
<td>0.49</td>
<td>5.7 (2.6–12)</td>
</tr>
<tr>
<td>Unbearable pain</td>
<td>274/475 (57.7)</td>
<td>28/31 (90.3)</td>
<td>246/444 (55.4)</td>
<td>90.3</td>
<td>44.6</td>
<td>1.6</td>
<td>0.22</td>
<td>7.5 (2.2–26)</td>
</tr>
<tr>
<td>Not like dysmenorrhea</td>
<td>335/473 (70.8)</td>
<td>28/31 (90.3)</td>
<td>307/442 (69.5)</td>
<td>90.3</td>
<td>31.2</td>
<td>1.3</td>
<td>0.32</td>
<td>4.1 (1.2–14)</td>
</tr>
</tbody>
</table>

Se, sensitivity; Sp, specificity; Lr, likelihood ratio; DOR, diagnostic odds ratio.*Because of missing data, total may differ from 496.

### Table II

<table>
<thead>
<tr>
<th>Predictor</th>
<th>aDOR 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unilateral lumbar or abdominal pain</td>
<td>aDOR 95% CI</td>
</tr>
<tr>
<td>No</td>
<td>1</td>
</tr>
<tr>
<td>Yes</td>
<td>23.3</td>
</tr>
<tr>
<td>Leucorrhea or metrorrhagia</td>
<td>aDOR 95% CI</td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
</tr>
<tr>
<td>No</td>
<td>7.0</td>
</tr>
<tr>
<td>Ovarian pain</td>
<td>aDOR 95% CI</td>
</tr>
<tr>
<td>No</td>
<td>1</td>
</tr>
<tr>
<td>Yes</td>
<td>5.5</td>
</tr>
<tr>
<td>Unbearable pain</td>
<td>aDOR 95% CI</td>
</tr>
<tr>
<td>No</td>
<td>1</td>
</tr>
<tr>
<td>Yes</td>
<td>5.0</td>
</tr>
<tr>
<td>Vomiting</td>
<td>aDOR 95% CI</td>
</tr>
<tr>
<td>No</td>
<td>1</td>
</tr>
<tr>
<td>Yes</td>
<td>3.7</td>
</tr>
</tbody>
</table>

aDOR, adjusted diagnostic odds ratio; 95% CI: 95% confidence interval.

![Figure 2](https://academic.oup.com/humrep/article-abstract/27/8/2359/711273) ROC curve of the SAQ-GE AT score.
In a previous retrospective study, a composite score based on anamnesis, clinical examination and ultrasonography was built to predict AT (Huchon et al., 2010). This 105-point score included the absence of leucorrhea and metrorrhagia, presence of a cyst of more than 5 cm on ultrasonogram, pain duration \(<8\) h at presentation, vomiting and spontaneous unilateral or abdominal pain. Patients in the low-risk group with this score had a predicted risk of 3.7\% (95\% CI, 0.0–7.8) of AT, which is as useful for triage as the predicted risk of 0.3\% (95\% CI, 0.0–0.9) obtained by the SAQ-GE torsion score \(\leq 6\) to rule out AT. Three out of five items of the previous torsion score were based on anamnesis and two are included in the SAQ-GE torsion score: spontaneous unilateral lumbar or abdominal pain and vomiting, while pain lasting \(<8\) h was significant in bivariate analysis. Missing data for the timing of pain, dropped in the multivariate analysis, could be a limitation of our study, as it might be a meaningful variable for the preoperative diagnosis of AT, as described previously. However, the SAQ-GE torsion score without inclusion of the duration of pain is more efficient for triaging AT than our previous score. In that previous study, the absence of leucorrhea and metrorrhagia was assessed by a gynecologist specialist registrar, unlike the SAQ-GE study which obtained this item from a questionnaire filled out by the patient. The last item of the previous torsion score was the presence of an ovarian cyst \(>5\) cm, requiring an ultrasound scan. Two new items in the SAQ-GE torsion score are the presence of unbearable pain and ovarian pain. Unbearable pain appears to be a qualitative descriptor of the pain, relating to pain intensity and also present in the McGill pain questionnaire, since the pain with AT appears to be severe (Lomano et al., 1970; Melzack, 1975; Nichols and Julian, 1985). Ovarian pain is an unusual new item, as none of the previous studies on AT focused on the subjective experience of the patients, unlike our study in which the SAQ-GE was constructed using the Colaizzi method (Colaizzi, 1978). The presence of this item suggests that clinicians need to listen carefully to patients when elaborating a diagnosis. The SAQ-GE torsion score appears more efficient to rule out AT, using simply a standardized questionnaire, than a complete medical consultation with adjunct of ultrasonography.

History taking appears to be a key element of diagnosis. Interpreting the patient’s words and translating them in terms of symptoms, i.e. neuroanatomy, help with the diagnosis. The usual problem is the interpretation of history taking. With the SAQ-GE, there is no longer any problem of interpretation. Through the use of good questions, well formulated (by the patients themselves), we have access almost directly to the symptoms of patients with AT.

The SAQ-GE torsion score seems to be very useful for triaging patients for AT in patients with acute pelvic pain. Scores often provide low classification rates but the SAQ-GE torsion score was capable of ruling out AT for 66\% of the patients in our population presenting severe pain, at a risk of \(<0.5\%\). Conversely, patients with a score of \(>6\), presenting a 97\% Se for diagnosis of AT, are those who need further investigations for the diagnosis of AT, such as ultrasonography or and laparoscopy (Huchon and Faucconnier, 2010). This score seems also useful for the early diagnosis of AT, as two-thirds of the patients presented with a pain dating back \(<8\) h.

The SAQ-GE torsion score does not need any examination or complementary examination in order to be calculated. It could be applied to patients presenting acute pelvic pain immediately on the admission to general EDs, by non-clinicians. Implementation of this diagnostic

<table>
<thead>
<tr>
<th>Variable</th>
<th>Points</th>
<th>Predicted risk, % (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unilateral abdominal or lumbar pain</td>
<td>3</td>
<td>0.3% (0–0.9)</td>
</tr>
<tr>
<td>Absence of leucorrhea and metrorrhagia</td>
<td>2</td>
<td>12.4% (7.0–17.8)</td>
</tr>
<tr>
<td>Ovarian pain</td>
<td>2</td>
<td>52.2% (31.7–72.6)</td>
</tr>
<tr>
<td>Unbearable pain</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Total SAQ-GE torsion score</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

CI, confidence interval.
method could be generalized by upscaling, useful in crowded EDs. Indeed, the self-administered questionnaire can be filled out manually but with the burgeoning new technologies, alternative methods of filling it out can be considered, using, for example, a host terminal or touch pads. Collection of the SAQ-GE, associated with the collection of other data, would then be instantly processed by a computer and its results would predict patients who belong to a risk group of diseases being studied.

Application of the score could rule out AT in patients in the low-risk group, avoiding unnecessary referral to the gynecologic department for suspicion of AT and thus reducing the time taken to make the appropriate diagnosis and treat these patients. On the other hand, suspicion of AT in the high-risk group may improve referral to gynecology and decrease the time before laparoscopy. A larger prospective, international and randomized multicenter study is needed to evaluate the accuracy of the SAQ-GE torsion score compared with other means for diagnosis of AT and to evaluate potential health-care cost savings. Since no experience is needed to assess the SAQ-GE torsion score, it may be suitable for routine triaging of patients for AT at the admission to EDs and could be of potential interest in developing countries.

Authors’ roles

C.H.: acquisition, analysis and interpretation of data, drafting the article. P.P.: acquisition and interpretation of data and revising the article critically for important intellectual content. G.K.: acquisition and interpretation of data and revising the article critically for important intellectual content. T.S.: acquisition of data and revising the article critically for important intellectual content. T.N.: acquisition of data and revising the article critically for important intellectual content. A.F.: study design, drafting and revising the article critically for important intellectual content.

Funding

This study was financially supported by AP-HP (Assistance Publique—Hôpitaux de Paris).

Conflict of interest

The authors have no conflict of interest to disclose.

References