The supine apprehension test helps predict the risk of recurrent instability after a first-time anterior shoulder dislocation

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Background: We previously identified the positive result of the supine apprehension test after completion of rehabilitation following a first dislocation as a possible predictor of high risk for redislocation. We extend the follow-up of a previous cohort of patients with first-time shoulder dislocations to better assess this test.

Methods: Fifty-three men aged 17 to 27 years who sustained a first traumatic shoulder dislocation were treated by shoulder immobilization for 4 weeks and then rehabilitated with a standard physical therapy protocol. At 6-week follow-up, a supine anterior apprehension test was performed to assess the risk of redislocation. The patients were observed prospectively for a minimum of 75 months.

Results: Of the 53 participants, 52 (mean age, 20.2 years) completed the study follow-up. Of the 52 subjects, 41 (79%) were combat soldiers. Follow-up was between 75 and 112 months. Of the 52 subjects, 31 (60%) redislocated at a range of 3 to 70 months after the initial dislocation. Eleven of 14 subjects (79%; confidence interval, 52%-92%) with a positive anterior apprehension test result redislocated, compared with 20 of 38 patients (53%; confidence interval, 37%-68%) with a negative test result. Patients with a positive test result redislocated more and earlier ($P=0.02$, PROC LIFETEST, SAS).

Conclusions: The results of the supine apprehension test after a first shoulder dislocation and rehabilitation can help predict risk for recurrent instability. It potentially may be included as a variable in decision analysis models.

Level of evidence: Level I, Diagnostic Study.

IRB approval: Israeli Defense Forces Medical Corps (274-2004) and Hadassah University Hospital.

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Personalized medicine is the tailoring of medical treatment to the individual characteristics, needs, and preferences of each patient. This principle can be applied to the young patient who sustains a first-time traumatic anterior shoulder dislocation. The first element of the treatment is unequivocal. The shoulder dislocation must be reduced. The goal of the subsequent treatment is to prevent recurrent dislocations. How to achieve this is the dilemma. The shoulder is traditionally immobilized to prevent immediate redislocation, even though this treatment has not been proved to be effective in reducing recurrent dislocation. Initial reports that immobilization in external rotation may be more effective in reducing recurrent dislocation have not been supported by subsequent level I studies.

Mather et al introduced a Markov decision model for patients with first-time anterior shoulder dislocations. They constructed the decision model with outcome probabilities and effectiveness based on the literature and expert opinion. Their original model includes only 2 risk factors, gender and age. Sachs et al identified contact or collision sports in the young patient and overhead occupational activities as risk factors for recurrent dislocation after a primary shoulder dislocation. These variables are not in the Mather model. Their model is constructed in such a way that additional variables, once identified and validated, can be incorporated into the model.

We previously reported on the use of the supine apprehension test as a tool for identifying patients with a high risk for recurrent shoulder dislocation after a first-time anterior shoulder dislocation. Our first report was short term. Because the test could potentially be added to the Markov decision model, we now report the results with a minimum 75 months of follow-up. The longer term follow-up further documents the use of the supine anterior apprehension test in predicting the risk for recurrent dislocation after a first-time anterior shoulder dislocation.

Methods

As part of a prospective study that began in January 2004, 53 consecutive male patients in the age group of 17 to 27 years who sustained documented first traumatic shoulder dislocation were observed to evaluate the predictive value of the supine apprehension test in determining risk for redislocation. The initial results of the 24- to 48-month follow-up of the group have previously been reported. This report extends the follow-up to a minimum of 75 months. Institutional Review Board approval from the Israeli Defense Forces Medical Corps (274-2004) and Hadassah University Hospital was received for this study. The goals and study methods were explained to participants both in a written information sheet and orally before the study. Informed written consent was obtained from all participants.

After being treated in a shoulder immobilizer for 4 weeks, the patients were treated according to a standard physical therapy protocol. Six weeks after the dislocation, participants underwent a supine apprehension test. Before the test, a detailed explanation of how it would be performed was given, but participants were not told what might be their reaction to avoid bias. The test was presented to them as one of the tools used by the medical staff to assess the stability of their shoulder. The test was performed bilaterally, first on the nonaffected arm and then on the affected arm. The test was done with the patient lying supine, with the affected arm brought to 90° of abduction and the elbow flexed to 90°. The examiner supported the elbow with one hand, grasped the distal forearm with the other hand, and quickly rotated the arm externally from neutral rotation toward 90° of external rotation. The examination was done twice. The apprehension test result was defined as positive on the basis of the presence on both repetitions of at least 1 of 2 criteria: resistance or apprehension during the maneuver. The participant was considered to be apprehensive according to his facial expression or if he stated that he felt his shoulder was about to “come out of place.” Patients considered to have clinically stable shoulders on the basis of a negative supine apprehension test result were allowed to return to full activity 3 months after their dislocation. Patients with positive supine apprehension test results returned to activity levels determined by their level of confidence. Two participants were unable to return to normal activity. The follow-up at 1 year and at yearly intervals afterward was done by a single dependent observer (C.M.) either by telephone interview or at a clinic visit. Patients were asked if they (1) participated in sports, (2) were still protective of their shoulder, (3) had sustained a new dislocation, (4) had sustained a new subluxation, (5) had undergone surgery and inquired of the results, or (6) were contemplating having surgery.

The Fisher exact test was used to assess whether there was a statistically significant difference between shoulder dislocation recurrence of subjects with and without a positive anterior apprehension test result. Confidence intervals were calculated comparing probabilities of redislocation occurrence between patients with positive or negative apprehension test results. Survival analysis was performed with the LIFETEST procedure (SAS 9.2, Cary, NC, USA) to assess whether there was a statistically significant difference in shoulder dislocation recurrence of participants with and without a positive anterior apprehension test result. The relationship between the patient’s age and the presence or absence of recurrent dislocation was assessed by the t test.

Results

Of the 53 study participants, 52 (98%) were available for the long-term review. All 52 subjects completed every
phase of treatment and follow-up. Forty-one (79%) were combat soldiers. The mean age was 20.2 years (range, 17-27 years). Follow-up was between 75 and 112 months after the first dislocation. Of the 52 subjects, 31 (60%) redislocated within 3 to 70 months after the initial dislocation (Fig. 1). Fourteen had a positive supine apprehension test result and 38 had a negative test result on examination 6 weeks after the first dislocation. Eleven of 14 patients (79%; confidence interval [CI], 52%-92%) with a positive supine anterior apprehension test result redislocated compared with 20 of 38 patients (53%; confidence interval, 37%-68%) with a negative supine apprehension test result (P = .06). By survival analysis (Fig. 2), patients with a positive apprehension test result were at significantly greater risk for redislocation (P = .02). No statistically significant association was found between the patient’s age and recurrent dislocation (P = .6).

**Discussion**

Treatment decisions in medicine should be based on the best available statistical evidence and clinical evidence individualized to the patient. Statistical trends in the short
run often may give an inaccurate picture of what occurs in the long run. Such is the case in our evaluation of the supine apprehension test as a predictor for risk of recurrent shoulder dislocation after a first-time anterior dislocation in young, very active male patients. During our initial evaluation at 24 to 48 months of follow-up, we found that 34% of the patients with a negative test result and 64% of the patients with a positive test result had experienced recurrent dislocation. According to the present evaluation, with a minimum of 75 months of follow-up, the redislocation rate increased to 53% for those with a negative test result and 79% for those with a positive test result. Whereas both these recurrence rates are high, there may be patients who will elect not to have primary surgery when informed that they have almost a 50% chance of not sustaining a new dislocation.7,10

The supine apprehension test, like most clinical tests, is imperfect. A positive test result indicates the presence of shoulder instability when a quick passive external rotation movement to the shoulder is applied by the examiner while the shoulder is abducted to 90°. The test cannot be expected to cover all events that may happen to the shoulder in the world outside of the physician’s office. This inherently limits its predictive ability. The physician’s evaluation of whether a patient exhibits apprehension during the test has potential subjective elements, but this is always the case when human judgment is involved. The test’s advantages are that it is easy and convenient to perform and requires no additional health care expenditures.

The present study, with a patient follow-up of 75 to 112 months, shows that the supine apprehension test can be a useful tool in classifying patients into risk groups after a first shoulder dislocation when the test is done 6 weeks after the dislocation, following a period of immobilization and rehabilitation. The parameter of the supine apprehension test could be added as an additional risk factor to the predictive model of shoulder instability such as proposed by Mather et al.9 Its inclusion may improve the predictive ability of the model and facilitate better personalized treatment. Additional studies will be required to fully integrate this parameter into the model. This is because the current study population is composed of male participants with a mean age of 20.2 years and a range of 17 to 27 years. Seventy-nine percent of the study cohort consisted of combat soldiers. Similar to contact sport athletes, this population had a high exposure rate to trauma after the first dislocation. For a population with lower trauma exposure, the rates of recurrent shoulder dislocations of patients with negative and positive supine apprehension test results may be different.

Bishop et al1 developed an expected-value decision analysis to determine the optimal management strategy, either nonoperative treatment or arthroscopic stabilization, for a first-time traumatic anterior shoulder dislocation. They based their scoring, which determines outcome probabilities, on a MEDLINE database literature review from 1950 to 2010. Utility value scores are given for operative and nonoperative treatment after a first traumatic shoulder dislocation. The score for operative treatment includes postoperative infection, stiffness, and recurrence. They use a lower recurrence rate than that found by Hovelius et al.13 In a 17-year follow-up, they found that 28% of patients after a Bankart procedure either sustained dislocation or experienced subluxation after surgery. Overall, Bishop et al recommend primary surgery. In a clinical setting in which there is a low probability for recurrence or when the patient has an aversion to surgery, they recommended conservative care.

The present study has several strengths. The study dropout rate during the course of a minimum of 75 months of follow-up was only 2%. The patient follow-up was done annually, during the course of the 6- to 10-year study follow-up period. A single physician performed this follow-up. That physician initiated his association with the patients no later than 3 months after they sustained their first dislocation. The study population is limited to subjects who had traumatic dislocations. The study uses a tool, the supine apprehension test, that is both convenient and easy to use and adds no increased economic cost to the patient’s care.

The present study also has several limitations. The cohort is exclusively male, with a high exposure to repeated trauma. Therefore, conclusions should not be extrapolated to women or patients with a low exposure rate to repeated trauma. The study cohort is primarily combat soldiers whose exposure and demographics may differ from those of professional and recreational athletes. In addition, when using the study tool, the supine apprehension test, examiners can potentially have varied interpretations as to the participant’s response to the test. The follow-up of patients in this study was not always done by frontal examination and was sometimes based on a telephone interview. On simple analysis of redislocation compared with the apprehension test, we found borderline significance (P = .06). We attribute this to the relatively small sample size. The disadvantage of this analysis is that it does not take into account when the dislocation occurs or the data regarding subjects lost to follow-up. For that purpose we used the LIFETEST procedure in SAS, using methods known to correct for those limitations in contingency table–based calculation.3 This analysis found a significance of P = .02.

**Conclusions**

We found in this study that at a minimum follow-up of 75 months, young patients with first-time traumatic shoulder dislocations can be divided into risk groups by the supine apprehension test performed 6 weeks after dislocation and following rehabilitation. Those with a positive test result have had a 79% rate (CI, 52%-92%) of recurrent shoulder dislocation, and those with a negative test result had a 53% rate (CI, 37%-68%) of
recurrent shoulder dislocation. Those with a positive test result also sustained redislocation earlier than those with a negative supine apprehension test result. This information can be used to better inform patients of their specific prognosis after a first-time dislocation. This variable can also be added to decision analysis models.

Disclaimer

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