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# The Evaluation of Various Physical Examinations for the Diagnosis of Type II Superior Labrum Anterior and Posterior Lesion

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**Background:** Many types of physical examinations have been used to diagnose superior labrum anterior and posterior lesions; no decisive clinical test is available for confirming the diagnosis.

**Hypothesis:** A selection from 10 well-established physical tests, alone or in combination, can be used to differentiate lesions with biceps anchor detachment from those with an intact biceps anchor with arthroscopic correlation.

**Study Design:** Case control study (diagnosis); Level of evidence, 3.

**Methods:** Among 297 patients who underwent shoulder arthroscopy between January 2004 and July 2005, 146 patients were enrolled in the study as a type II superior labrum anterior and posterior lesion group and an age-matched control group. Sensitivity, specificity, and predictive values of each test and all possible combinations of 2 and 3 tests were analyzed. The same procedures were repeated in patients younger than and older than 40 years.

**Results:** The sensitivities of the Whipple, O'Brien, apprehension, and compression-rotation tests and the specificities of the Yergason, biceps load II, and Kibler tests were relatively high. No single physical examination was found to be simultaneously highly sensitive and specific for the diagnosis of a type II superior labrum anterior and posterior lesion. When 2 of the 3 relatively sensitive tests (O'Brien, apprehension, or compression-rotation test) were combined with 1 of the 3 relatively specific tests (Speed, Yergason, or biceps load II test), sensitivity and specificity reached approximately 70% and 95%, respectively. Similar trends were noted in the younger and older patient groups and in the isolated type II superior labrum anterior and posterior lesion group.

**Conclusion:** The data suggest that some combinations of 2 relatively sensitive clinical tests and 1 relatively specific clinical test increase the diagnostic efficacy of superior labrum anterior and posterior lesions. Requiring 1 of the 3 chosen tests to be positive will result in a sensitivity of about 75%, whereas requiring all 3 to be positive will result in a specificity of about 90%.

**Keywords:** superior labrum anterior and posterior lesion (SLAP) lesion; physical examination; diagnostic value

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Shoulder arthroscopy has made it possible to identify various lesions around the shoulder and has markedly increased our understanding of shoulder injuries. It has also contributed to the diagnosis and treatment of superior labrum anterior and posterior (SLAP) lesions since Andrews et al<sup>1</sup> first described in 1985 anterosuperior labral tears near the origin of the long head of the biceps

in throwing athletes. Snyder et al<sup>21</sup> termed the acronym "SLAP lesion" and classified it into 4 distinct categories. Among the various types, the type II SLAP lesion is the most common and is known to differ from the other SLAP lesions in terms of anchor detachment and treatment.<sup>12</sup> Although a definitive diagnosis of SLAP lesion is typically made by arthroscopic observations, clinical suspicion is important before the imaging study. However, symptoms in most patients with type II SLAP lesions are nonspecific, and patients usually complain of posterior shoulder pain or click, which might be exacerbated at a certain shoulder position. Moreover, although type II SLAP lesions are known to be associated with overhead activity or major trauma, some patients experience no such overt traumatic event.<sup>1,3,12,20</sup> Subjective symptoms and history might also

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be confused by accompanying problems such as rotator cuff tear, osteoarthritis of the acromioclavicular joint, adhesive capsulitis, or instability. Furthermore, in imaging studies such as MR arthrography, which is known to be helpful for diagnosis, a type II SLAP lesion is often confused with degenerative changes and normal superior sublabral recess.<sup>17</sup> Therefore, clinical suspicion and physical examination should be emphasized so as to obtain a more accurate diagnosis and selection of the appropriate treatment.

Various physical examinations have been introduced for the purpose of improving the diagnosis of SLAP lesions, and their sensitivities and specificities have been reported to be excellent.<sup>2,6,7,14,21</sup> However, several studies<sup>4,5,11</sup> have revealed the sensitivities and specificities did not validate these initial reports. The current study was undertaken to evaluate the sensitivity, specificity, and predictive value of 10 different physical examinations for the diagnosis of type II SLAP lesions in younger and older patients with arthroscopic correlation. Our hypothesis was that 10 well-established physical tests, either alone or in combination, could be used to differentiate lesions with biceps anchor detachment from those with an intact biceps anchor, especially in younger patients.

## MATERIALS AND METHODS

A total of 297 patients underwent shoulder arthroscopy at our institution (Seoul National University Bundang Hospital) between January 2004 and July 2005. There were 26 patients with isolated type II SLAP lesions (8.8%) and 42 patients with type II SLAP lesions combined with other injuries (14%). These 68 patients with type II SLAP lesions (22.8%) were classified into an index group. Healthy subjects could not be enrolled as a control group (arthroscopy-confirmed intact biceps anchor), so 78 age-matched patients without type II SLAP lesions who had undergone arthroscopic shoulder surgery during the same period were classified as the control group. Shoulder disorders are characterized by a relatively age-specific pattern, so 78 patients were randomly selected from each age decade (Table 1). Patients with adhesive capsulitis, septic shoulder, and greater tuberosity fracture were excluded. The demographic patient data in the 2 groups were not statistically different except for sex ratio (Table 2). This study was performed prospectively and approved by the institutional review board at the authors' hospital. Informed consent was obtained from all patients.

Comprehensive physical examinations were conducted on admitted patients and recorded prospectively on the day before surgery by the senior author. Physical examinations for SLAP lesions included Speed,<sup>22</sup> Yergason, anterior apprehension,<sup>18</sup> relocation,<sup>10</sup> compression-rotation,<sup>21</sup> O'Brien,<sup>14</sup> Kibler,<sup>6</sup> biceps load II,<sup>8</sup> and Whipple<sup>19</sup> tests, as well as biceps groove tenderness.

## Tests

**Speed Test.** This test is performed by resisting downwardly applied pressure to the arm when the shoulder is positioned in 90° of forward elevation with the elbow

TABLE 1  
Selection of Patients in Control Group

Age, y	No.
10-20	3 <sup>a</sup>
20-30	15
30-40	15
40-50	15
50-60	15
60-70	10
70-80	5

<sup>a</sup>Only 3 patients were present in this age range.

TABLE 2  
Demographic Data and Arthroscopic Findings<sup>a</sup>

	SLAP II Group	Control Group
No. of patients	68	78
Male:female	50:18	44:34
Mean age, y (range)	45 (17-75)	43.8 (19-79)
≤40 years	28	33
>40 years	40	45
Injuries		
Isolated type II SLAP lesion	26	0
Bankart lesions in instability	5	18
Partial-thickness rotator cuff tear	21	21
Full-thickness rotator cuff tear	16	34
No injury	0	5

<sup>a</sup>SLAP, superior labrum anterior and posterior lesion.

extended and forearm supinated; a positive test result should produce pain into the biceps region.

**Yergason Test.** The elbow is flexed to 90°, and the forearm is pronated. While holding the patient's wrist, the examiner directs the patient to actively supinate against resistance; a positive test result should produce pain into the biceps region.

**Anterior Apprehension Test.** As the shoulder is moved passively into maximum external rotation in abduction and forward pressure is applied to the posterior aspect of the humeral head, the patient complains of pain or instability.

**Relocation Test.** As the examiner administers a posteriorly directed force on the humeral head during the apprehension test, pain or instability is relieved.

**Compression-Rotation Test.** With the patient supine and the shoulder abducted 90°, the glenohumeral joint is manually compressed through the long axis of the humerus while the humerus is passively rotated back and forth. The test result is considered positive if there is a click or pain with compression.

**O'Brien Test (Active Compression Test, Flexion-Adduction Test).** Resistance is tested with the arm forward flexed to 90° and adducted 10° with the thumb pointing down. Pain is lessened or disappears when the test is repeated in the same shoulder position but with the thumb pointing up.

**Kibler Test (Anterior Slide Test).** With the patient's hands on the hips with thumbs pointing posteriorly, the examiner applies an axially directed force at the elbow in the direction of the glenohumeral joint while the patient resists this

TABLE 3  
Diagnostic Values of Physical Examinations<sup>a</sup>

Physical Examination	All Patients				≤40 Years				>40 Years			
	SE	SP	PPV	NPV	SE	SP	PPV	NPV	SE	SP	PPV	NPV
Tenderness on biceps groove	27 (27)	66 (66)	41 (21)	51 (73)	18	85	50	55	33	52	38	47
Speed test	32 (27)	66 (66)	46 (21)	53 (73)	29	91	73	60	35	48	38	45
Yergason test	12 (15)	87 (87)	44 (29)	53 (75)	18	100	100	59	8	77	23	48
Relocation test	44 (35)	54 (54)	52 (24)	47 (67)	46	61	57	50	43	50	48	45
Compression-rotation test	61 (73)	54 (54)	55 (35)	61 (85)	68	61	59	69	56	49	50	55
O'Brien test	63 (65)	53 (53)	55 (33)	61 (81)	61	58	55	63	64	49	54	59
Kibler test	21 (12)	70 (70)	38 (12)	50 (70)	14	73	31	50	26	67	42	50
Biceps load II test	30 (32)	78 (78)	59 (36)	52 (75)	36	92	83	56	26	69	45	49
Anterior apprehension test	62 (61)	42 (42)	56 (32)	49 (71)	64	64	67	61	61	27	50	36
Whipple test	65 (68)	42 (42)	50 (28)	57 (79)	64	64	60	68	66	24	45	43

<sup>a</sup>Values are percentages. NPV, negative predictive value; PPV, positive predictive value; SE, sensitivity; SP, specificity. The numbers in parentheses represent the sensitivity, specificity, PPV, or NPV in groups of isolated superior labrum anterior and posterior lesions (SLAP) (those who had only a SLAP lesion without other pathologies).

maneuver. The test result is considered positive if there is a click or pain deep in the shoulder.

**Biceps Load II Test.** The shoulder is abducted to 120° and maximally externally rotated, the forearm is maximally supinated, and the elbow is placed at 90° of flexion. The patient is asked to forcefully flex the elbow against the examiner's resistance. The test result is considered positive if the patient complains of pain during the resisted elbow flexion and if the patient complains of more pain from the resisted elbow flexion regardless of the degree of pain before the elbow flexion maneuver.

**Whipple Test.** The arm is flexed 90° and adducted until the hand is opposite the other shoulder. The physician pushes downward on the arm, and the patient resists the downward pressure. A positive test result is one that elicits pain in the shoulder or down the arm.

**Biceps Groove Tenderness.** With the shoulder adducted about 10°, the examiner gently presses the biceps groove of the proximal humerus. The test result is considered positive if the patient experiences pain.

All patients underwent arthroscopic surgery by the senior author. Patients were in the lateral decubitus position with the affected arm positioned in an arm holder under 10 lb of traction. The superior labrum complex was palpated with a probe to determine the type of SLAP lesion. The SLAP lesions were graded according to the classification system of Snyder et al.<sup>21</sup> When the "peel-back" phenomenon was observed during abduction and external rotation position, the superior labrum was elevated more than 5 mm with a cartilaginous crack, and a hemorrhagic spot or inflammatory granulation tissues beneath the detached superior labrum were observed, the lesion was diagnosed as a type II SLAP lesion.<sup>12</sup> Other arthroscopic findings had been recorded prospectively and reviewed (Table 2).

Sensitivities, specificities, positive predictive values, and negative predictive values were calculated for individual physical examination tests using 2 × 2 tables. In addition, we calculated the diagnostic accuracy of combinations of 2 and 3 physical examinations. Combinations of 2 of the 10 physical examinations resulted in 45 combinations, and combinations

of 3 from these 10 resulted in 120 combinations. Moreover, the elements in each combination were related using logical "and" (requiring all tests to have positive results) or logical "or" (requiring any of the tests to have a positive result) connectors. Thus, we analyzed 90 combinations of 2 physical examinations and 240 combinations of 3.

Accompanying injuries, such as rotator cuff tear in older patients or Bankart lesion in younger patients, might result in biased physical examinations. Therefore, we examined the diagnostic accuracy of each physical examination in 2 different age groups with a cutoff of 40 years of age. Furthermore, the isolated type II SLAP lesions were separately considered.

## RESULTS

The results and diagnostic values for each physical examination are summarized in Table 3. In terms of the diagnosis of type II SLAP lesions, the Whipple test was found to be most sensitive (65%) and the Yergason test the most specific (87%). Positive and negative predictive values of all tests were between 38% and 61%. The sensitivities of the Whipple, O'Brien, anterior apprehension, and compression-rotation tests were all more than 60%, whereas the specificities of the Yergason, biceps load II, and Kibler tests were all more than 70%. No physical examination test simultaneously exhibited high sensitivity with high specificity. Similar trends were observed in younger and older patients and in patients with an isolated SLAP lesion.

When physical examinations were combined with "or," that is, allowing any test result to be positive, sensitivities increased. On the other hand, when they were combined with "and," that is, requiring all test results to be positive, specificities increased. The sensitivity of the compression-rotation test and anterior apprehension test was highest (75.4%) for the 2 "or" combinations, and the specificity of the Yergason and the compression-rotation test was highest (94.7%) for the 2 "and" combinations. The sensitivity of the Speed, compression-rotation, and anterior apprehension

TABLE 4  
Diagnostic Values of 3 Combinations of Physical Examinations in Entire Population<sup>a</sup>

Combination	Yergason		Biceps Load II		Speed	
	SE	SP	SE	SP	SE	SP
<b>And</b>						
Compression rotation and anterior apprehension	12 (13)	96 (96) <sup>b</sup>	26 (30)	90 (90) <sup>b</sup>	25 (17)	92 (92) <sup>b</sup>
Compression rotation and O'Brien	10 (15)	96 (96) <sup>b</sup>	22 (28)	95 (95) <sup>b</sup>	22 (19)	92 (92) <sup>b</sup>
Anterior apprehension and O'Brien	10 (13)	92 (92) <sup>b</sup>	21 (26)	93 (93) <sup>b</sup>	25 (22)	88 (88) <sup>b</sup>
<b>Or</b>						
Compression rotation or anterior apprehension	75 (84) <sup>b</sup>	29 (29)	77 (84)	29 (29)	80 (84) <sup>b</sup>	28 (28)
Compression rotation or O'Brien	73 (81) <sup>b</sup>	32 (32)	74 (81)	26 (26)	79 (85) <sup>b</sup>	28 (28)
Anterior apprehension or O'Brien	74 (73) <sup>b</sup>	28 (28)	74 (73)	28 (28)	77 (73) <sup>b</sup>	24 (24)

<sup>a</sup>SE, sensitivity; SP, specificity. Values in parentheses are percentages. The numbers in parentheses represent the sensitivity, specificity, PPV, or NPV in groups of isolated superior labrum anterior and posterior lesion (SLAP) (those who had only a SLAP lesion without other pathologies).

<sup>b</sup>These values are significant results (not statistically significant).

(or Whipple) test was highest (80.3%) for the 3 "or" combinations, and the specificity of the Yergason, compression-rotation, and relocation test was highest (96.4%) for the 3 "and" combinations.

No combination of the 2 physical examinations yielded all diagnostic values more than 60% simultaneously. However, certain combinations of 3 physical examinations did increase sensitivity and specificity simultaneously. That is, when 2 physical examinations were chosen from the compression-rotation, O'Brien, and anterior apprehension tests, which had relatively high sensitivities, and 1 from the Speed, Yergason, and biceps load II tests, which had relatively high specificities, the sensitivities of the 3 "or" combinations were approximately 75%, and the specificities of the 3 "and" combinations were approximately 90% (Table 4). For example, when the compression-rotation, anterior apprehension, and Speed tests were combined, the sensitivity of the 3 "or" combinations was 80.3%, and the specificity of the 3 "and" combination was 92.2%; that is, if at least 1 test result were positive, 80.3% of true SLAP II patients could be detected, and if no test results were positive, the possibility of not having a SLAP II lesion was 92.2%.

In the present study, we also divided patients into 2 age groups, that is, 40 years of age and younger and older than 40 years, because the age affects the prevalence, clinical features, combined pathologic entities, and prognosis of various shoulder conditions, such as rotator cuff disease, shoulder instability, as well as SLAP lesion.<sup>13</sup> The clinical features of type II SLAP lesions are also known to be dependent on patient age,<sup>9</sup> and thus, we believed the results of physical examinations would differ in the younger and older patient groups. Although the diagnostic accuracy of some of the physical examinations was better in the younger group, no single test was found to be capable of diagnosing type II SLAP lesions in the younger patients. Also, when 2 or 3 physical examinations were combined, similar results were obtained regardless of age (Table 5).

There were 26 patients with an isolated type II SLAP lesion in the study group, and we also compared these 26 patients with the control group. Fifteen patients (58%)

were younger than 40 years. Eleven were older than 40 years, but there was no patient with an isolated type II SLAP lesion older than 60 years. Although we could not divide the patients into different age groups because of the small number of cases, the results of diagnostic accuracy of a single or combination test for an isolated SLAP lesion were not statistically different from those of patients with other pathologic changes (parenthesized number in Tables 3 and 4).

## DISCUSSION

We demonstrated that a combination of 2 relatively sensitive clinical tests and 1 relatively specific clinical test increased the diagnostic efficacy of SLAP lesions. By combining 2 tests from the compression-rotation, O'Brien, and anterior apprehension tests with 1 from the Speed, Yergason, and biceps load II tests, the sensitivities of the 3 "or" combinations reached approximately 75% and the specificities of 3 "and" combinations 90% (Figure 1).

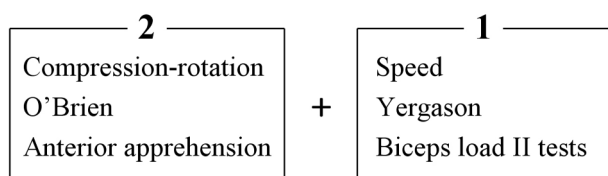
In recent years, symptomatic SLAP lesions have been treated effectively by arthroscopic debridement as well as superior labrum or biceps anchor repair, depending on the injured structures.<sup>12,23</sup> According to Snyder's classification, a type II SLAP lesion differs from the others in that it is the only type II lesion that features biceps anchor detachment.<sup>21</sup> Different types of SLAP lesions are known to exhibit different clinical features, and the surgical procedure of the type II SLAP lesion is different from the other types because it is focused on unstable biceps repair.<sup>12,23</sup> Generally, physical examinations reproduce pain by creating tension in the long head of the biceps or impingement of the labrum and adjacent structures. Therefore, we presumed that most physical examinations that produce tension or impingement exacerbate symptoms more when the biceps anchor is detached. Thus, we tried to compare patients with a type II SLAP lesion and patients with an intact biceps anchor by means of arthroscopic correlation.

We hypothesized that 1 or more of the 10 physical tests, either alone or in combination, would differentiate lesions

TABLE 5  
Diagnostic Values of 3 Combinations of Physical Examinations According to Age<sup>a</sup>

Combination	Yergason		Biceps Load II				Speed					
	SE		SP		SE		SP		SE		SP	
	<40 Years	>40 Years	<40 Years	>40 Years	<40 Years	>40 Years	<40 Years	>40 Years	<40 Years	>40 Years	<40 Years	>40 Years
<b>And</b>												
Compression rotation and anterior apprehension	18	8	100 <sup>b</sup>	93 <sup>b</sup>	32	26	96 <sup>b</sup>	90 <sup>b</sup>	28	23	100 <sup>b</sup>	86 <sup>b</sup>
Compression rotation and O'Brien	16	7	100 <sup>b</sup>	93 <sup>b</sup>	28	22	96 <sup>b</sup>	95 <sup>b</sup>	24	21	97 <sup>b</sup>	88 <sup>b</sup>
Anterior apprehension and O'Brien	18	5	100 <sup>b</sup>	86 <sup>b</sup>	32	21	100 <sup>b</sup>	93 <sup>b</sup>	27	23	100 <sup>b</sup>	79 <sup>b</sup>
<b>Or</b>												
Compression rotation or anterior apprehension	77 <sup>b</sup>	74 <sup>b</sup>	46	17	82 <sup>b</sup>	74 <sup>b</sup>	46	17	77 <sup>b</sup>	82 <sup>b</sup>	41	17
Compression rotation or O'Brien	72 <sup>b</sup>	74 <sup>b</sup>	46	22	72 <sup>b</sup>	76 <sup>b</sup>	36	19	77 <sup>b</sup>	81 <sup>b</sup>	42	17
Anterior apprehension or O'Brien	73 <sup>b</sup>	74 <sup>b</sup>	32	25	73 <sup>b</sup>	74 <sup>b</sup>	35	25	73 <sup>b</sup>	80 <sup>b</sup>	32	18

<sup>a</sup>SE, sensitivity; SP, specificity. Values are percentages.  
<sup>b</sup>These values are significant results (not statistically significant).



→ about 75% sensitivities of the three “OR” combinations  
about 90% specificities of three “AND” combinations

**Figure 1.** When 2 physical examinations were chosen from the compression-rotation, O'Brien, and anterior apprehension tests, which had relatively high sensitivities, and 1 from the Speed, Yergason, and biceps load II tests, which had relatively high specificities, the sensitivities of the 3 “or” combinations were approximately 75%, and the specificities of the 3 “and” combinations were approximately 90%.

with an unstable biceps anchor and lesions with an intact biceps anchor. However, single physical examinations have proven to be unsatisfactory for the diagnosis of type II SLAP lesions, and this situation was similar in younger and older patients, although the sensitivities and specificities of some physical examinations were higher in the younger patients. In this sense, our results are concordant with those of previous studies.<sup>4,5,11,16</sup> We think the predictive values are not usefully meaningful because they vary by study population and/or prevalence of the disease. We also agree that no currently available pathognomonic clinical test can diagnose biceps anchor detachment. However,

we did demonstrate that a combination of 2 relatively sensitive clinical tests and 1 relatively specific clinical test increases the diagnostic efficacy of SLAP lesions. Although the Whipple test was also sensitive in itself, combinations with other tests did not attain higher levels. Guanche and Jones<sup>4</sup> also combined 3 examinations but did not analyze all of the combinations, and they adopted just 3 physical examinations out of the 7 tests that appeared to be of some value for diagnosing glenoid labral lesions.

Initially, Snyder et al<sup>21</sup> reported the incidence of SLAP lesion to be 6%; however, most recent reports<sup>9,15</sup> have suggested the incidence of the SLAP lesion to be somewhat higher. Parentis et al<sup>15</sup> reported the prevalence of overall SLAP lesions to be 30.3% and type II SLAP lesions 17.4%. The incidence of isolated type II SLAP lesions in our study was 8.8%, and the overall incidence of the type II SLAP lesion was 22.9%. This relatively high incidence of SLAP lesions was attributed to an increase in the detection of SLAP lesions due to the development of more accurate pre-operative imaging tools, the use of the popularized arthroscopic technique, and an increased awareness of the disease. Generally, SLAP lesions are known to be asymptomatic in patients older than 40 years. However, we think that SLAP lesions might be symptomatic in some patients older than 40 years depending on the pathomechanism, such as trauma or repetitive overhead activities. We strictly followed the diagnostic criteria of the SLAP lesion by means of the objective arthroscopic findings<sup>12</sup> in symptomatic patients. The high incidence of type II SLAP lesion in our series may also be attributed to our hospital being a tertiary referral hospital for patients from all over the country.

Many types of physical examinations are useful for the diagnosis of SLAP lesions. Conversely, the number of tests used in itself suggests that the diagnosis of a SLAP lesion

is difficult, and no clinical test can decisively confirm the presence of a SLAP lesion. Actually, several studies have evaluated the diagnostic efficacies of different types of physical examinations in the context of SLAP lesion diagnosis. McFarland et al<sup>11</sup> demonstrated that the active compression test was the most sensitive (47%) and that the anterior slide test was the most specific (84%). They reported that active compression, anterior slide, and compression-rotation tests are less accurate than originally reported, and they recommended that a decision to operate on a shoulder for a suspected SLAP lesion should not be made based on these tests alone. In a 9-test study, Parentis et al<sup>16</sup> undertook a prospective clinical study to determine the most effective maneuver for the diagnosis of SLAP lesions, but no test proved to be sensitive (at best, 65.2% for the active compression test) or specific (at best, 92.7% for the Yergason test) enough for the diagnosis, and thus, they concluded that diagnostic arthroscopy remains the best means of definitively diagnosing a SLAP lesion. Guanche and Jones<sup>4</sup> studied the diagnostic efficacies of 7 clinical tests for the diagnosis of glenoid labral lesions (alone or in combination). They reported respective sensitivities and specificities for the Jobe relocation test of 44% and 87%, for the O'Brien test of 63% and 73%, and for the anterior apprehension test of 40% and 87%, which were at least of some value; moreover, the sensitivities and specificities of these 3 tests were far inferior to those of MR arthrography, even when combined (when they were 72% and 73%, respectively).

There are some limitations in the present study. First, we did not calculate interobserver or intraobserver reliability of the physical tests. Instead, we validated our data by having the single senior author prospectively confirm the results of all physical examinations in every patient to obtain consistency in the study. Second, patients with other shoulder injuries were included in the study. Physical examinations for SLAP lesions may have thus been inaccurate and not reflective of a true control due to accompanying pathologic entities, such as rotator cuff disorders or instabilities. Forty-two patients of the 68 type II SLAP patients also had other pathologic abnormalities, and 26 patients had an isolated SLAP lesion. However, when we compared the isolated SLAP lesion group with the control group, the results were not different from those of overall patients. Furthermore, we allocated patients with arthroscopically confirmed type II SLAP lesion as an index group, and patients without the type II SLAP lesion who were confirmed by arthroscopy during the same period were randomly selected as a control group. As is well known, the SLAP lesion is highly prevalent in younger age groups, so the grouping according to the presence of the SLAP lesion might have an age-related bias. Considering the age-specific distribution of the various shoulder diseases, 78 patients were randomly selected from each age decade to make up the age-matched control group. Ideally, an asymptomatic normal population with a normal imaging study would be a true control group. If we had compared isolated SLAP patients with normal healthy individuals, more reliable data could have been acquired; however, diagnostic arthroscopy in healthy people is essentially not possible. Normal patients will not present a positive test result, and asymptomatic patients do not normally go to the doctor in the real clinical situation. Therefore, this study

might be more meaningful in the real clinical setting because of the need to distinguish the SLAP lesion by physical tests from various other shoulder injuries.

There has been a lack of data regarding how many physical examination tests have to be performed for the diagnosis of a SLAP lesion, how the results are to be interpreted, and whether the physical tests correlate with the imaging study. To the best of the authors' knowledge, the present prospective study was the first to evaluate both the sensitivity and specificity of 10 different physical examinations in combination for the diagnosis of type II SLAP lesions with arthroscopic correlations in an unbiased age-matched population. Our data demonstrate that there is no pathognomonic physical examination for the diagnosis of SLAP lesions. However, 2 tests should be regularly performed from among the O'Brien, anterior apprehension, and compression-rotation tests and 1 from the Speed, Yergason, and biceps load II tests. For maximum sensitivity in diagnosing type II SLAP lesions, only 1 test result of the chosen 3 needs to be positive (the "or" option). For maximum specificity, all 3 of the chosen test results need to be positive (the "and" option). This method will yield a sensitivity of 75% and a specificity of approximately 90%. We believe this to be practical in that just 3 physical examinations that are familiar and consistent to the examiner would be sufficient to guarantee substantial sensitivity and specificity in a busy outpatient clinic.

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