

Role of Patrick-FABER test in detecting sacroiliitis and diagnosing spondyloarthritis in subjects with low back pain

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ABSTRACT

Objective. To evaluate sensitivity, specificity, and predictive value of Patrick-FABER test in assessing magnetic resonance imaging (MRI) sacroiliitis and addressing the diagnosis of spondyloarthritis (SpA) in subjects with low back pain (LBP).

Methods. Subjects with LBP were consecutively enrolled. The assessors were blinded to patients' clinical, laboratory, or imaging data. All subjects underwent sacroiliac joint MRI to detect presence of sacroiliac oedema or structural changes.

Results. One hundred and ten subjects were included in the study [males (61.8%); median age of 45 (21-69) years; LBP duration of 78 (3-240) months]. Patrick-FABER test sign's sensitivity was 76.2% (95% CI: 60.5-87.9%), specificity was 66.2% (95% CI: 53.6-77.2%), positive predictive value (PPV) was 58.1% (95% CI: 44.1-71.3%) and negative predictive value (NPV) was 81.8% (95% CI: 69.1-90.9%) for the diagnosis of sacroiliitis, with an overall diagnostic accuracy of 70%. At the univariate and multivariate analysis, Patrick-FABER test sign was associated with inflammatory lesions of sacroiliitis at MRI and SpA diagnosis. Univariate and multivariate analysis showed an association between smoking status ($p=0.01$), sacroiliitis, and SpA diagnosis. The odds of having sacroiliitis was 2.7 higher in smokers (OR: 2.7; 95% CI: 1.1-7) as compared to non-smokers and 6.3 higher in those with a positive Patrick-FABER test sign (OR: 6.3; 95% CI: 2.5-15.6) as compared to those with a negative sign.

Conclusion. Our study shows that Patrick-FABER test positivity could represent a useful clinical test for addressing the use of sacroiliac joints MRI and SpA diagnosis in subjects with LBP. Further, smoking habit could represent an associate anamnestic element for addressing the use of sacroiliac MRI.

Introduction

Sacroiliitis, a primary manifestation of spondyloarthritis (SpA), is a frequent cause of low back pain (LBP) (1-2). The sacroiliac joint is a complex system able to trigger different pain patterns and

clinical examination by a series of clinical tests have been reported useful to assess its inflammatory involvement (3-5). Among these, the Patrick-FABER test, evaluable through flexion, abduction and external rotation of the hip, represents a pain provocation test for assessing the diagnosis of pathologies at the sacroiliac region, as well at hip and lumbar regions (3-5). More in detail, during the Patrick-FABER test, the subject brings the ipsilateral knee into the flexion with lateral malleolus placed over the contralateral knee, and the examiner applies a light pressure over the ipsilateral knee, modestly forcing the knee to contact the table. If pain is elicited on the contralateral side posteriorly around the sacroiliac joint, it is suggestive of pain mediated by articular dysfunction (3-5).

Several studies have investigated the usefulness of Patrick-FABER test, suggesting that this could be used to identify inflammatory sacroiliitis in SpA patients (6, 10). Recently, our group has found in a cohort of fifty-one SpA patients that Patrick-FABER test correlated with inflammatory sacroiliac lesions as diagnosed by magnetic resonance imaging (MRI) (9).

Further, in a study on 65 patients with inflammatory LBP, FABER test was found to have a sensitivity of 75% and specificity of 19% for identifying sacroiliitis identified by magnetic resonance imaging (MRI) (10).

For this reason, the aim of this study was to evaluate sensitivity, specificity, and predictive value of Patrick-FABER test in detecting MRI sacroiliac lesions and addressing the diagnosis of SpA in subjects with LBP.

Subjects and methods

Consecutive adult subjects with chronic LBP were consecutively enrolled at the Rheumatology Unit of the University Federico II, Naples (Italy). Exclusion criteria were fibromyalgia, previous pregnancy, and presence of coxo-femoral joint replacement. We collected demographic and clinical data, and more in detail age, sex, body mass index (BMI), smoking habits, LBP (namely, time from onset of low back pain) duration, eventual presence of SpA manifestations (dactylitis, enthesitis, Crohn's

disease, ulcerative colitis, psoriasis, and uveitis), patient's pain visual analogue scale (VAS). We also assessed values of erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP).

Each patient was examined by a rheumatologist (MT). The assessor was blinded to patients' clinical, laboratory, or imaging data. All patients underwent MRI of the sacroiliac joints. According to ESSR Arthritis Subcommittee recommendations for appropriate scanning protocols for MRI, the sequences included simultaneous evaluation of T1-weighted (T1W) and fat-suppressed MRI sequences [such as short tau inversion recovery (STIR) and T2-weighted fat-suppressed turbo spin-echo (T2-FS) sequences] (11).

Positive MRI-Sacroiliac Joint scans were defined by the ASAS/Outcome Measures in Rheumatology MRI working group (ASAS/OMERACT) as the presence of inflammatory lesions such as subchondral bone marrow oedema (BMO) and hyper-intense lesions which are highly suggestive of SpA. The presence of periarticular erosions and subchondral sclerosis were considered as "structural changes" (12). SpA diagnosis was made by a rheumatologist (MT) (13). The study received ethical approval and complied with the Declaration of Helsinki. Informed consent was received from all participants.

Statistical analysis

Data are reported as mean values, standard deviation (SD) and range values (minimum and maximum). Univariate analysis was performed to test clinical variables (sex, age, BMI, smoking status, duration of low back pain, VAS patients for pain, positivity of Patrick-FABER test sign), and inflammatory markers (ESR, CRP) against the diagnosis of dactylitis, enthesitis, sacroiliitis, psoriasis, IBD and uveitis. For such analysis the statistical significance was set at $p < 0.10$, as in previous literature. For continuous variables, after testing the distribution using the Shapiro-Wilk test, the Student's t-test or the Wilcoxon rank sum test were used for normally and non-normally distributed variables, respectively. Categorical data were handled through chi-squared test. Variables

Table I. Main demographic and clinical characteristics of the study population.

	Entire population (n=110)	Patients with positive Patrick's FABER test (n=42)	Patients with negative Patrick's FABER test (n=68)	p-value
Age (years)	45 ± 11.1	44.3 ± 1.5	45.4 ± 1.4	0.30*
Female, n (%)	42 (38)	15 (35)	27 (39)	0.65**
BMI	26.9 ± 5.4	27 ± 0.8	26.7 ± 0.6	0.91***
Smokers, n (%)	39 (35)	17 (40)	22 (32)	0.38**
LBP duration (months)	78.8 ± 57.3	87.4 ± 9.7	73.5 ± 6.4	0.38***
MRI-sacroiliitis, n (%)	55 (50%)	32 (76.2)	23 (33.8)	<0.001**
Dactylitis, n (%)	10 (9)	3 (7)	7 (10)	0.57**
Enthesitis, n (%)	40 (36)	16 (38)	24 (39)	0.76**
Psoriasis, n (%)	81 (73)	33 (78)	48 (70)	0.41**
IBD, n (%)	9 (8)	5 (11)	4 (5)	0.26**
Uveitis, n (%)	11 (10)	2 (4)	9 (13)	0.15**
ESR (mm/h)	15 ± 12	13.5 ± 1.5	16 ± 1.5	0.45***
CRP (mg/dl)	0.7 ± 1.6	0.7 ± 0.1	0.7 ± 0.2	0.86***
VAS pain	5.8 ± 2.4	6.9 ± 0.2	5.2 ± 0.3	<0.001***

Values expressed as mean ± standard deviation (SD) or total number with percentage.

BMI: body mass index; ns: not significant; LBP: low back pain; SI: sacroiliac; IBD: inflammatory bowel disease; ESR: erythrocyte sedimentation rate; CRP: C-reactive protein.

*Student t-test; **Chi-squared test; ***Wilcoxon rank sum test.

significantly associated with the diagnosis of interest were then pooled in a multivariate model (logistic regression) to identify true predictors of disease. The effect size of each covariate was provided as an odds ratio (OR) with 95% confidence intervals (CIs). The Pearson correlation coefficient was used to test the association between a positive Patrick-FABER test sign and MRI. The statistical significance was set at $p < 0.05$. Sensitivity, specificity, positive predictive value (ppv), negative predictive value (npv) and overall diagnostic accuracy for the Patrick-FABER test sign in the diagnosis of sacroiliitis were calculated. Statistical analyses were performed using Stata/SE statistical software (v. 16; Stata, College Station, TX).

Results

Based on inclusion and exclusion criteria, 110 subjects were included in the study. The main demographic and clinical characteristics of the study population are reported in Table I. All the subjects enrolled were Caucasian (100%), with a prevalence of males (61.8%) and a median age of 45 (21–69) years. LBP duration was 78 (3–240) months. Positive and negative Patrick-FABER test were found in 42 and 68 patients, respectively. No significant differences were detected between the demographic, clinical, and laboratory char-

acteristics of the two groups, except for SI oedema and SI erosions detected by MRI, and for VAS pain (<0.001). Among patients showing SI oedema and diagnosed with SpA, 27 (64%) and 12 (17%) showed positive and negative Patrick-FABER test, respectively.

At the univariate analysis, age ($p=0.09$), smoking status ($p=0.01$) and Patrick-FABER test sign were associated with MRI sacroiliitis inflammatory lesions. Logistic regression showed that only Patrick's sign ($p<0.001$) and smoke ($p=0.02$) were associated with sacroiliitis. The odds of having sacroiliitis was 2.7 higher in smokers (OR: 2.7; 95% CI: 1.1–7) as compared to non-smokers and 6.3 higher in those with a positive Patrick-FABER test sign (OR: 6.3; 95%CI: 2.5–15.6) as compared to those with a negative sign.

Patrick-FABER test sign's sensitivity was 76.2% (95% CI from 60.5–87.9%), specificity was 66.2% (95% CI: 53.6–77.2%), positive predictive value (PPV) was 58.1% (95% CI: 44.1–71.3%) and negative predictive value (NPV) was 81.8% (95%CI: 69.10–90.92%) for detecting sacroiliitis and addressing the diagnosis of spondyloarthritis in subjects with low back pain, with an overall diagnostic accuracy of 70% (Table II).

Other significant associations between study clinical variables and MRI findings were not observed.

Table II. Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of Patrick's Faber test for detection of MRI-sacroiliitis.

Sensitivity (%)	76.2 (95%CI, 60.5–87.9)
Specificity (%)	66.2 (95%CI, 53.6–77.2)
PPV (%)	58.1 (95%CI, 44.1–71.3)
NPV (%)	81.2 (95%CI, 69.1–90.9)

Discussion

The main aim of this study was to evaluate sensitivity, specificity, and predictive value of Patrick-FABER test in detecting MRI sacroiliac lesions and addressing SpA diagnosis in subjects with LBP. In this study, we found that subjects with LBP with positive Patrick-FABER test showed a higher prevalence of MRI inflammatory lesions at level of sacroiliac joints.

Association between Patrick-FABER test positivity and oedema and periarticular erosions at level of sacroiliac joints was confirmed both in univariate and in multivariate analysis adjusted for sex and age.

Our study demonstrated that more than 70% (sensitivity around 76%) of subjects with LBP and positive Patrick-FABER test showed MRI inflammatory sacroiliitis.

On the other hand, more than the half of subjects with LBP and negative Patrick-FABER test (specificity: 66.2%) did not show bone marrow oedema or periarticular erosions at MRI.

Few studies have evaluated the usefulness of several sacroiliac joint pain provocation tests, including Patrick-FABER test in evaluating active sacroiliitis as detected by MRI in patients with SpA (8, 9).

Our data showing Patrick-FABER test as a sensitive (76.2%) and sensible (66.2%) tool for detecting MRI-sacroiliitis are in line with those from our recent study, as well as those from Castro *et al.* Indeed, in these two studies, sensitivity and specificity range from 71% to 88.9% and from 75% to 78.8%, respectively (8, 9).

Our results are also in line with a recent study by Salman *et al.*, in which the test showed a sensitivity of 75% in assessing the correlation with MRI-sacroiliitis. However, in comparison with our results, in this study, maybe due to

smaller cohort, a lower sensibility was shown (19%) (10).

Further, we found that there was an association between smoking status and MRI-sacroiliitis. In particular, smokers had a nearly threefold increase in the odds of having sacroiliitis (OR: 2.7; 95% CI: 1.1–7) as compared to non-smokers. This is in line with several previous data on axial SpA patients showing associations between smoking and structural damage, spinal, and sacroiliac joint inflammation (14–15).

The main strengths of our study are the careful evaluation of sacroiliitis by use of MRI, making the association between Patrick-FABER test and inflammatory sacroiliitis unconfounded by other relevant causal factors. The main limitations are represented by the variability of individual referred pain, the cross-sectional design and the small sample size of the cohort.

In conclusion, our study shows that Patrick-FABER test could be useful to detect inflammatory sacroiliitis and address SpA diagnosis in subjects with LBP. Further studies could be useful to validate Patrick-FABER test as a clinical “gold standard” for SpA diagnosis.

Key message

In case of suspicion of low back pain and spondyloarthritis, Patrick-FABER test could be useful to address the use of sacroiliac joint magnetic resonance.

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