Medical Students Learn Through Research on Prevalence of Sacroiliac and Pubic Symphysis Joint Shears in Chronic Low Back Pain and Impaired Single Leg Balance

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INTRODUCTION

Osteopathic medical students (OMS) learn how to integrate osteopathic manipulative treatment (OMT) into patient care for pain and function during years one and two (OMS2). OMS learn how to diagnose the six most prevalent osteopathic findings observed in Dr. Philip E. Greenman's study of patients with chronic low back pain (LBP) [1]:

- Lumbar spine non-neutral dysfunction
- Pubic symphysis dysfunction
- Sacral nutation restriction
- Innominate shear dysfunction
- Short-leg syndrome
- Muscle imbalance and/or impact of joint dysfunction on trunk and lower extremities.

The 30-second single leg balance (SLB) test evaluates for muscle imbalance of trunk and lower extremities. The relationship between chronic LBP and impaired SLB and its prevalence in OMS are unclear. It is also not clear which somatic dysfunctions are prevalent in impaired SLB.

Previous studies found the prevalence of LBP in medical students and its burden on quality of life [2,3]. However, most osteopathic physicians do not utilize or integrate OMT in practice [4].

Previous studies suggest participation in research while learning osteopathic medicine may improve learning [5]. In this study, as second year OMS participated in a prevalence study of sacroiliac and pubic symphysis joint shears in impaired SLB and chronic LBP, we investigated the impact of research participation on their understanding of chronic LBP exam findings and management. Concurrently, we can utilize the findings documented by OMS2 to study the prevalence of sacroiliac and pubic symphysis joint shears in those with impaired SLB and chronic LBP.

OBJECTIVE

Primary: To investigate the impact of participating in a prevalence study on OMS's understanding of exam findings pertinent to assessment and plan for chronic LBP.

Secondary: Assess the prevalence of sacriliac and pubic symphysis joint shears in those with impaired SLB and chronic LBP among OMS2.

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METHODS

IRB Approval: BHS-1519
Study Design: Observational Cross-Sectional Study.
During an osteopathic medicine diagnosis and treatment LBP laboratory session, second year OMS were paired. OMS completed REDCap worksheets as they performed history and physical exam, including a 30-second SLB test. At the end of the self-completed REDCap worksheet, OMS were asked if this study improved their understanding of chronic LBP history, exam findings, and management.

After duplicates and incomplete surveys were removed, 99 REDCap responses were analyzed. Innominate diagnoses named by students were classified as correct or incorrect based on documented physical exam findings describing the standing flexion test, positioning of posterior superior iliac spine (PSIS), anterior superior iliac spine (ASIS), and pubic tubercle relative to the contralateral side. In responses with correctly named innominate diagnosis (N=80), the prevalence of chronic LBP, impaired SLB, and innominate diagnoses (shears, rotations, or no dysfunction) were calculated.
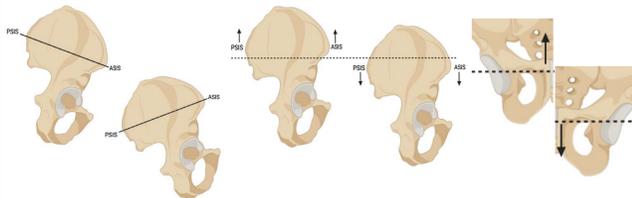

Figure 1. Left to Right: Anterior and Posterior Innominate Rotations, Superior and Inferior Innominate Shears, and Superior and Inferior Pubic Shears

For the medical education question in which we asked OMS2 if this study improved their understanding of chronic LBP, exam findings, and management, the outcome variable was provided on a four-point ordinal scale: "Yes, definitely," "Somewhat," "Not sure," and "Not at all." Independent data was analyzed using chi-square test.

The prevalence of chronic LBP, impaired SLB, innominate rotations, and innominate shears in OMS2 were calculated, and associations were analyzed using chi-square test.
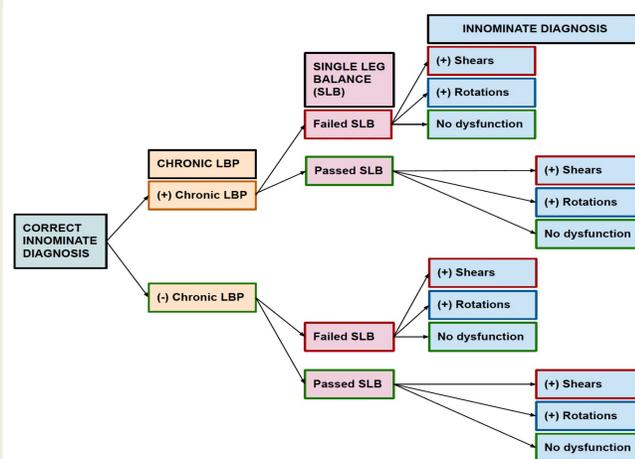

Figure 2. Innominate Diagnosis Classification Tree.

RESULTS

Correct Innominate Diagnosis = 80 (80.8% out of 99)

Diagnosis/Test		Count (Percent)
Chronic Low Back Pain (LBP)	Positive	19 (23.8%)
	Negative	61 (76.2%)
Single Leg Balance (SLB)	Either Right or Left Failed	12 (15.0%)
	Both Right and Left Passed	68 (85.0%)
Innominate Diagnosis	Shears	15 (18.8%)
	Rotations	64 (80.0%)
	No Dysfunction	1 (1.2%)

Table 1. Report of chronic LBP, impaired SLB, and innominate diagnoses (shears, rotations, no dysfunction) by 80 OMS with correctly named innominate diagnoses.

Association among Chronic LBP, SLB and Innominate Diagnosis

Chronic LBP	SLB	Innominate Diagnosis			p-value*
		Shears (+)	Rotations (+)	No Dysfunction	
Positive	Failed	1 (100.0%)	0 (0.0%)	0 (0.0%)	0.003
	Passed	1 (5.6%)	17 (94.4%)	0 (0.0%)	
Negative	Failed	1 (9.1%)	9 (81.8%)	1 (9.1%)	0.06
	Passed	12 (24.0%)	38 (76.0%)	0 (0.0%)	

Table 2. Association among chronic LBP, SLB, and innominate diagnoses in 80 OMS with correct innominate diagnoses. *The p-value is the result of chi-square test.

Association between Chronic LBP and SLB

Chronic LBP	Single Leg Balance		p-value*
	Failed	Passed	
Positive	1 (5.3%)	18 (94.7%)	0.17
Negative	11 (18.0%)	50 (82.0%)	

*p-value is the result of chi-square test.

Association between Chronic LBP and Innominate Diagnosis

Chronic LBP	Innominate Diagnosis			p-value*
	Shears (+)	Rotations (+)	No Dysfunction	
Positive	2 (10.5%)	17 (89.5%)	0 (0.0%)	0.48
Negative	13 (21.3%)	47 (77.0%)	1 (1.6%)	

*p-value is the result of chi-square test.

Association between SLB and Innominate Diagnosis

SLB	Innominate Diagnosis			p-value*
	Shears (+)	Rotations (+)	No Dysfunction	
Failed	2 (16.7%)	9 (75.0%)	1 (8.3%)	0.06
Passed	13 (19.1%)	55 (80.9%)	0 (0.0%)	

*p-value is the result of chi-square test.

Table 3. Associations between chronic LBP and SLB, chronic LBP and innominate diagnosis, and SLB and innominate diagnoses in 80 OMS with correctly diagnosed innominates. The p-values were obtained from chi-square test.
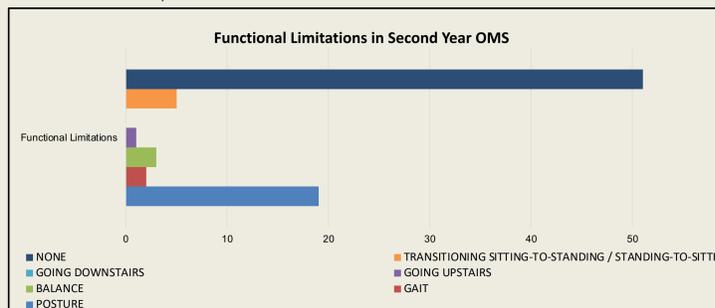

Chart 1. Functional limitations reported during history taking from 80 students with correctly diagnosed innominates.

Prevalence of	No functional limitations (N=51)	Some functional limitations (N=29)	p-value
Chronic LBP (+)	9.8%	48.3%	<0.001
SLB failed (+)	13.7%	17.2%	0.75
Shears (+)	23.5%	10.3%	0.23
Rotations (+)	76.5%	86.2%	0.39

Table 4. Functional limitations and prevalence of chronic LBP, failed SLB, shears, and rotations in 80 OMS with correctly diagnosed innominates.

RESULTS

When asked if the study improved their understanding of chronic LBP exam and management, responses from 99 OMS were:
- 50.5% "Yes, definitely," 40.4% "Somewhat," 3% "Not at all."
- There were 6 missing responses (6%) for this question.

Chronic LBP was documented in 23.2% of 99 OMS. Innominates were correctly diagnosed in 80.8% (80/99). In this group:
- Innominate diagnosis: 64 rotations (80.0%), 15 shears (18.8%), and 1 with no dysfunction (1.2%).
- 12 (15.0%) failed SLB.
- 19 (23.8%) had chronic LBP. 1 had impaired SLB and shear. On the other hand, of the remaining 18 OMS with chronic LBP and passed SLB, 17 had innominate rotations and 1 had shear dysfunction.
- For association between chronic LBP, SLB, and innominate diagnosis, the p-values were 0.003 and 0.06, although significant results may not be reliable because counts are sparse.
- 29 OMS had functional limitations, and 48.3% of which had chronic LBP. The remaining 51 OMS had no functional limitations but 9.8% reported chronic LBP (p-value < 0.001).

CONCLUSIONS

Results suggest that OMS believed their understanding of chronic LBP exam findings and management improved through participation in this study. In the prevalence aspect of the study, we found that the relationship between chronic LBP and impaired SLB prevalence in this population was not significant. In OMS with chronic LBP, functional limitations, such as impairment in balance, posture, and difficulty transitioning between sitting and standing, were more frequently reported. In OMS who failed SLB, there were more innominate rotations than shears.

Limitations: Though no identifiers were collected, and responses were not graded, social desirability bias may limit this study's ability to determine if participation in prevalence research improved OMS's understanding of chronic LBP exam and management. As a prevalence study, limitations include inaccurately identifying anatomical landmarks and innominate diagnoses among OMS2.

Future studies could determine which other joint dysfunctions affect SLB, include OMS from several schools, and consider functional measures even when pain is not a complaint. Further research may also include an assessment of OMS's baseline knowledge of chronic LBP exam and management prior to participation in the prevalence study. The positive impact of participating in a prevalence research on OMS's understanding of chronic LBP exam and management would also benefit from future studies that include faculty-student interrater reliability to avoid incorrect physical exam entries.

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