The Diagnostic Funnel - A Systematic Selection Protocol to Optimize Outcomes in Minimally Invasive Sacroiliac Joint Fusion: A Retrospective Cohort Study

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Abstract

To address variability in minimally invasive sacroiliac joint fusion (MI SIJF) outcomes, this study evaluated a stringent, multi-stage "Diagnostic Funnel"—incorporating clinical history, physical examination, and a 14-day therapeutic corticosteroid response—to predict superior clinical results. A retrospective chart review of 19 MI SIJF procedures demonstrated 100% adherence to a three-stage protocol: (1) chronic non-radicular pain with a positive Fortin Finger Sign; (2) at least 3-out-of-6 positive provocative maneuvers; and (3) a "Durability Threshold" of at least 70% pain relief maintained for at least 14 days following an image-guided steroid injection. The primary outcome was the change in Visual Analog Scale (VAS) pain scores at 6 months postoperatively. Results showed that Gaenslen's (94.7%) and Thigh Thrust (89.5%) were the most frequent positive maneuvers. Protocol adherence correlated with a 74.7% mean pain reduction, and 94.4% of patients achieved the Minimal Clinically Important Difference (a greater than or equal to 20-point VAS reduction). In conclusion, this rigorous "Diagnostic Funnel" optimized candidate selection and yielded outcomes exceeding traditional benchmarks.

Introduction

Chronic low back pain remains one of the most challenging conditions to diagnose and treat. While lumbar disc pathology and facet joint arthrosis are frequently suspected, clinical evidence suggests that the sacroiliac (SI) joint is the primary pain generator in approximately 15% to 30% of patients presenting with non-radicular low back pain.[1, 2] While the efficacy of minimally invasive sacroiliac joint fusion (MI SIJF) has been well documented in recent years, the variability in reported responder rates across studies suggests that surgical success may depend on the precision of the preoperative diagnostic workup.

In our recent analysis of 19 minimally invasive sacroiliac joint fusions, we observed a mean pain reduction of 74.7% and a 94.4% success rate. We hypothesize that these superior clinical outcomes are a direct result of a multi-stage "Diagnostic Funnel" designed to maximize specificity. The first stage of this funnel relies on a detailed clinical history and physical examination. Pathognomonic signs, such as the Fortin Finger Sign, in which a patient points directly to the posterior superior iliac spine (PSIS), raise initial clinical suspicion.[3] This is followed by provocative physical testing, in which a cluster of at least three of six positive maneuvers has been shown to have high diagnostic sensitivity. [4, 5]

However, the final step in the diagnostic pathway—the intra-articular injection—lacks consensus on the threshold for surgical candidacy. Landmark multicenter trials, such as the INSITE[6] and iMIA[7] studies, utilized a 50% pain relief threshold from transient anesthetic blocks for inclusion. Yet, recent evidence suggests that short-acting anesthetic blocks may be susceptible to false positives due to the placebo effect or anesthetic "leak" into the lumbosacral plexus.[8]

This paper aims to provide a standardized framework for identifying patients most likely to benefit from minimally invasive sacroiliac joint fusion. By strictly requiring a positive Fortin Finger Sign, a 3-test provocative cluster, and a sustained 14-day response to corticosteroids, we aim to demonstrate a refined selection protocol that ensures the SI joint is the primary pain generator and optimizes long-term surgical success.

Methods

A retrospective chart review of 19 MI SIJF procedures was conducted. Surgical candidacy required 100% adherence to a three-stage protocol: (1) chronic non-radicular pain with a positive Fortin Finger Sign; (2) a minimum of 3-out-of-6 positive provocative maneuvers; and (3) a "Durability Threshold" of at least 70% pain relief maintained for at least 14 days following an image-guided SI corticosteroid injection. The primary outcome was the change in Visual Analog Scale (VAS) pain scores at 6 months post-operatively.

Diagnostic Phase	Clinical Metric	Inclusion Requirement
I. Clinical History	Duration of Pain	> 6 months (Chronic)
	Physical Limitations	Limitations in walking, sitting, standing, stair climbing, lifting, carrying, and/or straightening up
	Pain Localization	Positive Fortin Finger Sign (Pain at PSIS)
	Conservative Care	Failure or intolerance to 6 weeks of PT/Manual Manipulation and/or NSAIDs
	Confirmatory Imaging	CT or MRI of SI joints demonstrating Spondyloarthropathy (sclerosis, degeneration)
II. Physical Exam	Provocative Maneuvers	3 out of 6 Positive Provocative Maneuvers (SI Compression, ASIS Distraction, Gaenslen's, FABER, Thigh Thrust, and Yeoman's)
	Differential Dx	Negative exam findings for hip (ROM) & lumbar (SLR)
III. Diagnostic Corticosteroid Injections	Guidance	Image-Guided (Fluoroscopy or CT) w/ Contrast
	Threshold	At least 70% Pain Relief for a minimum of 2 weeks after SI corticosteroid injection

Table 1. The Diagnostic Funnel established to ensure patients were good candidates for SI joint fusion.

Results & Discussion

The retrospective chart review of our 19 MI SIJF confirmed 100% adherence to the multi-stage diagnostic protocol required for surgical candidacy. Each patient underwent the full "Diagnostic Funnel" as outlined in Table 1, ensuring that the sacroiliac joint was the primary pain generator before fusion.

Pre-operative physical examination records demonstrated that all of our patients met the 3-out-of-6 threshold for provocative maneuvers suggestive of SI joint pathology. The frequency of positive responses for specific provocative maneuvers was highest for Gaenslen's (94.7%), Thigh Thrust (89.5%), and FABER (89.5%) tests, followed by Yeoman's (47.4%), SI Compression (36.8%), and ASIS Distraction (26.3%). Both hip and lumbar pathologies were also ruled out for all of our patients, as documented in the initial History and Physicals.

All patients in our cohort also underwent at least one image-guided SI corticosteroid injection that met the 70% relief for 2 weeks threshold. This high response to corticosteroid injections suggests that the pre-injection diagnostic workup successfully identified patients with intra-articular pathology before the injections were even administered. In addition, the 14-day sustained relief served as a clinical simulation for the surgical outcome.

Strict adherence to this diagnostic protocol was correlated with the superior clinical outcomes reported in our previous analysis. Specifically, the cohort achieved a 74.7% mean reduction in VAS pain scores at 6 months. Furthermore, the 94.4% success rate for reaching the Minimal Clinically Important Difference (MCID) validates that the 70% relief-for-2-weeks threshold is a reliable predictor of post-operative success in minimally invasive sacroiliac joint fusion.

Despite the high responder rates and the rigor of the "Diagnostic Funnel," this study has several limitations. First, the sample size of 19 MI SIJFs is relatively small compared to those of large multicenter studies. Second, the retrospective nature of the study introduces potential selection bias. The data was collected from a single-center, single-surgeon experience, which may reflect specific technical proficiencies or localized patient demographics. Finally, the lack of a control group makes it difficult to definitively isolate the "Diagnostic Funnel" as the sole variable for success. Future prospective, randomized trials comparing the 50% anesthetic threshold against the 70% corticosteroid threshold are warranted to further validate these findings.

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