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Revisiting The Piriformis Syndrome – High Frequency Ultrasonography In Management: A Pilot Series

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ABSTRACT

Piriformis syndrome (PS) is rare, presenting with symptoms and signs closely resembling L5 and S1 radiculopathy. It is a diagnosis of exclusion, requiring a high index of suspicion. Numerous clinical tests and electrodiagnosis are inconclusive. Magnetic Resonance Neurography (MRN) of Sciatic nerve yields better results but is limited by cost and lack of availability at all centres. High frequency ultrasonography (HFUS) of the Sciatic nerve overcomes the above limitations and is a reliable tool for positive diagnosis with ease of performance especially in various dynamic postures. Conventional treatment of PS is unrewarding to the physician and frustrating to the patient whereas Botulinum toxin injection into the Piriformis muscle under ultrasound guidance gives considerable relief from pain. A pilot series of five patients with clinical features of PS, confirmed by diagnostic HFUS, three of whom were injected with a fixed dose of Botulinum Toxin type A (50 units) into the Piriformis muscle on the affected side are described. Pain assessment before and three weeks after injection using the Numeric Rating Scale (NRS) demonstrated significant improvement.

Keywords: Piriformis Syndrome, High Frequency Ultrasonography, Botulinum toxin.

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INTRODUCTION

Piriformis Syndrome (PS) is an uncommon condition caused by entrapment and compression of Sciatic nerve in or under the Piriformis muscle. Symptoms include pain, tingling and numbness in the gluteal region and along Sciatic nerve [3]. Diagnosis is difficult due to lack of validated, reproducible and standardised tests. Electrophysiologically the Flexion Adduction Internal Rotation (FAIR) test which measures delay in sciatic nerve conduction when stretched against the Piriformis and Magnetic Resonance Neurography (MRN) have been found useful, though not uniformly applicable[2]. Hence PS continues to remain a diagnosis of exclusion, the differential being spinal root compression. Under such circumstances, high frequency ultrasonography (HFUS) of Sciatic nerve,[4,5] easily performed as an outpatient procedure is advantageous as it unmasks dynamic Sciatic compression which is not possible with MRN. It also offers the second advantage of guiding treatment with Botulinum injection into the ipsilateral Piriformis either in the same sitting or separately.

MATERIALS AND METHOD

Case 1:

46 yr old housewife presented with two year history of right gluteal pain radiating down the leg, aggravated by sitting and relieved by standing or walking. Though routine neurological examination was normal, flexion, adduction and internal rotation at hip revealed precipitation of same symptoms. MRI of the lumbosacral spine and Nerve conduction/EMG studies were normal. HFUS of the right sciatic nerve showed compression below the Piriformis muscle. Pregabalin 150 mg daily for over three months did not give relief. Botulinum Toxin type A (BTX-A) 50 units injected into the belly of right Piriformis muscle under ultrasound guidance gave relief from pain. NRS[12] pain score improved from 8 to 5 at the end of three weeks. Patient continued to remain on Pregabalin, 150 mg per day.

Case 2:

42 year old software professional presented with severe right gluteal pain radiating down the leg over a period of three years. MRI of the spine and electrophysiology on two separate occasions were inconclusive and he was given a tentative diagnosis of right L5 and S1 radiculopathy and had undergone lumbar L5 – S1 discectomy elsewhere which failed to give relief. Subsequently he was also given epidural analgesia which was short lived. He continued to take Pregabalin 150 mg per day. HFUS revealed compression of the right Sciatic nerve at the Piriformis . BTX-A 50 units were injected into the right Piriformis under ultrasound guidance. NRS score improved from 9 to 6 at the end of three weeks.

Case 3:

78 year old educationist leading an active academic life presented with left gluteal pain and paraesthesiae with radiation down posterolateral aspect of leg, aggravated by sitting and relieved by standing or walking over a few months duration. Flexion and internal rotation at hip with adduction aggravated symptoms. MR imaging of spine and electrophysiology was normal. HFUS revealed focal compression of left Sciatic nerve below the Piriformis. His NRS score was 6 at the time of diagnosis. This patient declined BTX-A injection.

Case 4:

47 year old housewife presented with right sciatica persistent over two years for which she was treated empirically with Pregabalin 150 mg per day. Neurological examination was normal. Tender spot over the right gluteal fold with a positive Tinel sign along the course of the right Sciatic nerve on applying pressure was noted. HFUS confirmed compression of right Sciatic nerve. BTX-A 50 units were injected under ultrasound guidance into right Piriformis. Subsequent pain relief was noted with NRS score decreasing from 7 to 4 at three weeks.

Case 5:

39 year old cab driver, accustomed to long hours of continuous driving, presented with pain in the posterior left thigh and frequent cramping of the hamstrings over one year. He also experienced tingling paresthesiae in the left shin and calf on driving for long hours which was disturbing enough for him to make frequent halts, get down and walk around his cab for a few minutes which relieved his symptoms partially. Neurologic examination did not reveal any deficits except hamstring spasm on the left. His baseline NRS score was 8. Electrophysiology and MRI of the lumbosacral spine were unremarkable. HFUS of the left sciatic nerve revealed blurred echotexture and oedema below the piriformis muscle. This patient declined BTX-A treatment due to financial constraints and continued on Pregabalin 150 mg daily along with an exercise regimen for PS.

Table 1 show Piriformis and Sciatic nerve dimensions on affected and normal sides and NRS before and after Botulinum injection in all subjects.

NOTE:

In all patients Ultrasonography was performed using Wipro GE Logic P9 Ultrasound machine with Matrix high frequency linear transducer probe. Base line high frequency scan of sciatic nerve was performed[4,5] in all five patients in prone position below the gluteal fold on both sides. Sciatic nerve imaged as linear parallel echogenic fascicular structure with nerve sheath appearing more echogenic on either side of the nerve. In cross section nerve appeared as echogenic fascicular structure surrounded by hyperechoic nerve sheath.

Injection Technique:

With patient in prone position the transducer was positioned in the transverse view, perpendicular to the gluteus maximus muscle. The probe was initially positioned with its lateral side medial to the greater trochanter and then with its medial side lateral to the ischial tuberosity. The piriformis muscle was identified between gluteal muscles and ischial spine and the sciatic nerve in close proximity. BTX-A was injected under real time HFUS guidance using 9cm 22 to 25 gauge (0.7 x90 mm) spinal needle into Piriformis belly at two sites in the middle third[1] of the muscle where it is thickest, 25 units at each site.

RESULTS AND DISUCSSION

In all patients, conventional physiotherapy including interferential therapy, intermittent lumbar traction and lumbar spine exercises had failed to give relief. Three patients who opted to have fixed dose BTX – A injection (50 units) reported significant pain relief (greater than or equal to 2 point reduction in NRS) at the end of three weeks with no new symptoms or signs [9, 10].

In all five patients on symptomatic side, the diameter of sciatic nerve was reduced at the point of compression with distal oedema seen as loss of distinction of nerve fiber echogenicity (blurred) and increase in nerve diameter which is the classical appearance of sciatic nerve in PS. (Figure 1 -4), (Table 1).

Table 1: Comparison of Piriformis and Sciatic nerve dimensions with NRS scores before and after Botulinum injection.

Subject	Age/Sex	Duration	Affected Side	Piriformis size (cm)		Affected Sciatic Nerve(cm)		Normal Sciatic Nerve(cm)		NRS Score	
				Right	Left	Above	Below	Above	Below	Before	After
1	46/F	2yrs	Right	0.86	0.78	0.34	0.55	0.37	0.40	8	5
2	42/M	3yrs	Right	0.84	0.79	0.35	0.57	0.38	0.41	9	6
3	78/M	6months	Left	0.57	0.61	0.37	0.58	0.35	0.39	6	-
4	47/F	2yrs	Right	0.83	0.75	0.33	0.48	0.39	0.41	7	4
5	39/M	1yr	Left	0.81	0.77	0.35	0.58	0.36	0.40	8	

Figure 1: High frequency ultrasound of normal right sciatic nerve in longitudinal section.

Figure 2: High frequency ultrasound of normal right sciatic nerve in cross section.

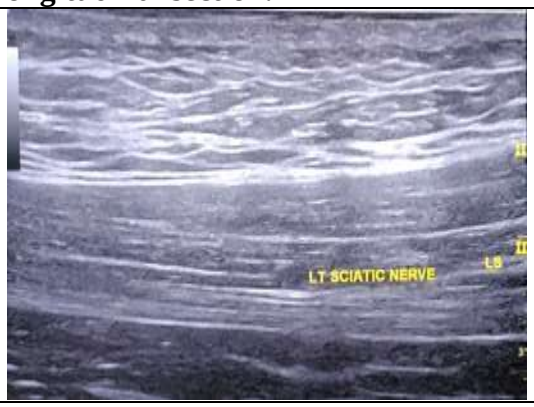

Figure 3: High frequency ultrasound of left sciatic nerve in longitudinal section. The nerve appears blurred and odematous below the piriformis muscle

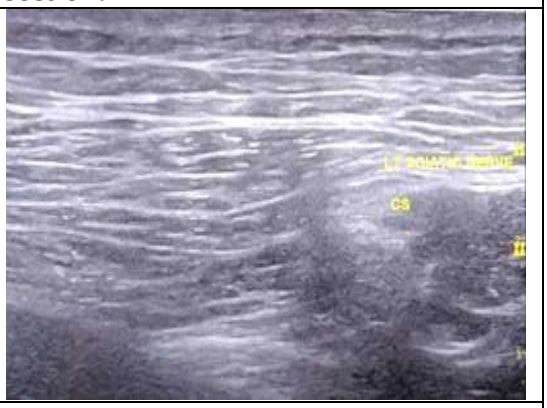

Figure 4: High frequency ultrasound of left sciatic nerve in cross section. The differentiation of nerve and nerve sheath is obscured because of oedema.

CONCLUSION

This pilot series of cases shows that meticulous neurologic examination with attention to detail in history helps in raising the index of suspicion of PS. Despite all patients having negative MR spine imaging and electrophysiologic findings, the emphasis here was on positive identification of Sciatic nerve compression. The need for avoiding the "diagnosis of exclusion" mindset cannot be overemphasized. Significant difference in sciatic nerve diameter pre and post compression as well as between symptomatic and asymptomatic sides has been noted in all patients. Besides, another observation which merits further exploration is the difference in thickness of the Piriformis muscle itself between the two sides(table 1). HFUS is simple to perform and cost effective as compared to MRN and electrophysiology[2]. Besides it also serves to guide BTX-A injection[6, 7]. These advantages are not brought to light in the extant literature. Treatment of PS is a long drawn out process and currently involves predominantly pharmacotherapy with physical measures for pain relief and exercise regimens to mitigate symptoms[7]. In this milieu, BTX-A offers a simple, safe and effective treatment

and has been shown to be superior to local anaesthetics and steroid injections[1, 8, 11]. Our experience of combining HFUS for diagnosis and also guided BTX-A injection reinforces this premise. The small number of patients and the duration of follow up detract from the study. However PS is a rare condition. We are nevertheless encouraged by the cost effectively and ease of performance of HFUS in either one or two sittings (for diagnosis and injection). The process of recruiting more patients is continuing so as to define positive HFUS based diagnostic criteria for PS, thus elevating it from being a diagnosis of exclusion. This no doubt would save both time and money spent which is extremely relevant from the point of view of practicing neurologists.

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