

Background

- Few studies have assessed minimally invasive nerve decompression (MIND) to treat Morton's Neuroma (MN).
- Prior studies have assessed patient satisfaction rather than complication rates or need for additional surgery. In addition these studies have not considered patients demographic and clinical characteristics that may aid in determining the optimal surgical approach.

Statement of Purpose

- Retrospective case series to evaluate the effectiveness of MIND to treat MN.
- Patient postoperative satisfaction and complication rates including the need for open neurectomy were assessed.
- Patient demographic and clinical characteristics were recorded.

Literature Review

- The reported incidence of MN is 50.2/100,000 cases for men and 87.8/100,000 cases for women (1).
- Non-operative management is often utilized as the first line of treatment with varying rates of success.
- Footwear modification has an efficacy of 41% (2).
- The efficacies of corticosteroid injection is 51%, sclerosing alcohol injection is 71%, and radiofrequency ablation is 81% and 59% of patients who undergo surgery fail at least 3-12 months of conservative treatment prior to surgery (3).
- Complication rates occur in up to 25% of surgically treated cases with greatest concern for stump neuroma formation in 6-14% of patients (2-4).

Materials & Methods

- Study Cohort:** Patients who underwent a MIND to treat a painful MN within a Kaiser Permanente Northern California (KPNC) facility between January 2008 and December 2017 and did not undergo any additional procedures at time of surgery (n=25 patients included).
- Clinical Diagnosis:** Based on clinical exam, history of present illness, results of previous diagnostic injections and pain upon palpation of the involved inter-metatarsal (IM) space. Presence of a Mulder's click preoperatively was recorded. Standard radiographs were reviewed to rule out possible osseous pathology which could contribute to the symptoms.
- Postoperative Complications:** Surgical site infections, wound healing complications, digital deformities, post-neuritic pain or the need for an open neurectomy following MIND.
- Clinical and Demographic Data:** Duration of symptoms from initial presentation to surgery, body mass index (BMI), smoking status, race/ethnicity, history of previous corticosteroid or sclerosing injections.

Materials & Methods, continued

- Postoperative satisfaction:** Patient responses to a series of questions. Satisfaction levels recorded as:
 - Excellent: No subjective pain, restriction with shoe gear, and/or vigorous activity.
 - Good: If pain was mild or there was occasional discomfort, or there was some restriction in shoe gear or mild restriction with vigorous activity.
 - Fair: If pain was moderate or consistent, or there was restriction with most shoe gear and/or activities.
 - Poor: If there was a need for an open neurectomy, additional treatments with corticosteroid injections for recalcitrant MN symptoms were required, there was a postoperative digital deformity, or the patient reported a poor level of satisfaction.

Figure: Surgical Steps for Minimally Invasive inter-metatarsal Nerve Decompression



Results

Table. Description of MIND procedures performed to manage MN, grouped by patient satisfaction (n=27 cases)**

Patient satisfaction	Age (years)	# CS* injections	Mulder's click	IM† space	Complications	Open neurectomy
Excellent						
	76	3	Yes	3 rd	None	No
	56	1	Yes	2 nd	None	No
	57	1	No	3 rd	None	No
	68	1	Unknown	2 nd	None	No
	65	1	No	3 rd	None	No
	54	0	No	3 rd	None	No
	51	1	Yes	3 rd	None	No
	56	2	Yes	3 rd	None	No
	49	1	No	3 rd	None	No
	46	3	Yes	3 rd	None	No
	45	2	No	3 rd	Dehiscence	No
Good						
	46	3	Yes	3 rd	None	No
	62	1	Yes	3 rd	None	No
Poor						
	56	2	Yes	3 rd	Continued painful MN	Yes
	53	1	Yes	3 rd	Dehiscence, Continued painful MN	Yes
	31	2	Yes	3 rd	Continued painful MN	Yes
	29	0	Yes	3 rd	Continued painful MN	Yes
	48	1	Unknown	3 rd	Continued painful MN	Yes
	74	3	Yes	3 rd	Continued painful MN	No
	57	1	Yes	3 rd	Continued painful MN	No
	56	2	Yes	3 rd	Continued painful MN	No
	50	2	Yes	3 rd	Continued painful MN	No
Not disclosed						
	58	1	Yes	3 rd	Dehiscence	No
	53	2	Yes	3 rd	None	No
	41	2	Yes	3 rd	Continued painful MN	No
	58	1	No	3 rd	Dehiscence	No
	62	1	Yes	3 rd	None	No

*Corticosteroid †Intermetatarsal **Morton's neuroma

Results, continued

- 27 MINDs were performed on 25 patients (2 performed bilaterally).
- 19 (76%) were female; mean age at time of surgery was 54.2 ± 11.1 (range 29-76) years; mean BMI of 26.6 kg/m² ± 5.5 (range 20.8-42.4). The mean duration of symptoms from presentation to MIND was 14.9 ± 12.1 (range 2.4 to 43.7) months.
- 25 cases (93%) performed to the 3rd IM space; 2 to the 2nd IM space.
- Corticosteroid injections administered prior to surgery for 25 cases (93%).
- Three cases underwent a series of preoperative sclerosing injections.
- Of the 22 (81%) procedures with patient satisfaction information, 11 (50%) had an excellent result, 2 (9%) a good result, none a fair result, and 9 (41%) a poor outcome. Among patients with poor satisfaction (n=9), 5 required an open neurectomy and 2 required additional corticosteroid injections. For the 5 cases with missing patient satisfaction information, none progressed to an open neurectomy.
- The mean duration between MIND and open neurectomy was 16.6 ± 12.3 (range 8.9 to 17.5) months.
- Preoperatively, the presence of a Mulder's click was noted in 19 (70.4%) IM spaces; absent in 6 (22.2%) and not documented in 2 (7.4%). Among the 6 without a Mulder's click, 5 had an excellent level of satisfaction and 1 was unknown.

Discussion & Conclusion

- Findings from this retrospective review of MIND procedures for primary operative management of MN suggests the procedure may not be as efficacious as seen previously in the literature.
- Even with lower rates of success, only a small number of patients required an open neurectomy.
- The best indication to perform a MIND procedure may be among patients that present with an absence of a Mulder's click, a neuroma of smaller size (< 1cm), and/or those with a shorter duration of symptoms.

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