Two-Point Discrimination Testing of the Abdominal Wall

Nathan Risk, MD, Dane Daley, MD, Matthew Sherrier, MD, Evert Eriksson, MD, FACS
Medical University of South Carolina

ABSTRACT

Roughly 100,000 patients admitted with fractured ribs every year.

High morbidity associated with rib fractures.

Denervation of the abdominal wall due to thoracic injury is an understudied area.

Our study seeks to assess the development of focused neurologic exam of the abdominal wall.

Two-point discrimination testing used to compare affected and unaffected side.

METHOD

Prospective data collected on 23 patients.

Patients screened at follow-up appointments in clinic.

Calipers were used to measure the point at which patient could differentiate two distinct points of touch.

Testing done in four zones

- Each test performed on left and right sides
- Costal margin
- Halfway between costal margin and umbilicus
- Level of the umbilicus
- Halfway between inguinal ligament and umbilicus

Cross sectional imaging reviewed to correlate rib fracture location with likelihood of denervation injury.

RESULTS

Of 23 patients: 21 suffered rib fractures and 2 intercostal neuralgia.

14 of 23 patients had asymmetric values on two-point discrimination testing on affected side.

7 of these 14 patients had EMG studies confirming denervation injury.

Average two-point discrimination of uninjured side: 3.9cm +/- 1.1cm.

Mean increase of two-point discrimination testing between injured and uninjured side: 3.7cm +/- 1.7cm.

No association between rib fracture location and risk of denervation.

No Difference in Two-Point Discrimination (n=9)

Rib Level	A	AL	L	PL	P
1					
2					
3		1		1	1
4			3	1	1
5			4		
6		1	3	1	2
7			4	2	1
8			2	3	
9				3	
10		1	2	4	
11				3	
12				1	

Difference in Two-Point Discrimination (n=14)

Rib Level	A	AL	L	PL	P
1		1			
2	1		2		
3	2	2	1	1	1
4	2		5	1	
5	1	2	4	2	
6	1	2	4	2	
7		3	2	1	1
8	1	1	2	1	1
9	1	1	1	2	
10			1	3	1
11					1
12					

Graph 1. Heat map of number of rib fractures by location according to cross sectional imaging

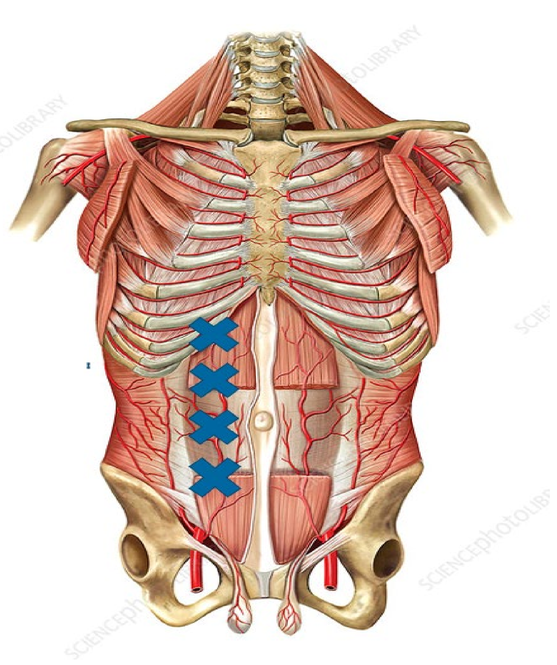

Figure 1. Testing locations on abdominal wall

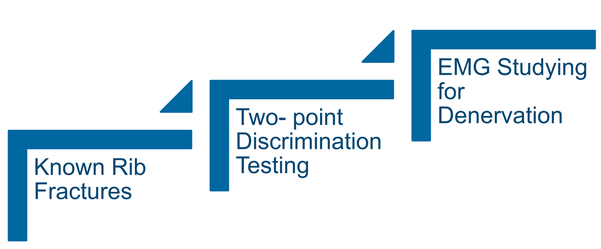

Figure 2. Step-up Approach for Denervation Injury

Figure 3. Caliper for two-point discrimination

CONCLUSIONS

Two-point discrimination can detect differences in sensation not perceived by light touch.

Large differences in two-point discrimination can help risk stratify patients for denervation injury.

Those with high risk of denervation injury can be confirmed with EMG studies.

Fracture location alone by imaging can not be used to risk stratify patients for denervation injury.

SUMMARY

Rib fractures can lead to intercostal nerve injury causing denervation of the abdominal wall

Two-point discrimination can be an effective, non-invasive adjunct to the physical exam for detecting denervation injuries.

Further studies should be performed to elucidate standard variation to the normal exam.

REFERENCES

1. Trauma and Acute Care open BMJ
2. SciencePhotoLibrary (Figure 1)
3. Harbor Freight (Figure 3)

Chest Wall Injury Summit
Atlanta, Georgia