Non-Unions
Fracture Nonunion

**FDA:** 9 months elapsed time with no healing progress for 3 months.

**Pragmatic:** A fracture that has no potential to heal without further intervention (> 3 months)

1 – 5 %
Stability.. Motion...Healing

- Mechanical Load & Motion stimulates bone formation

- "Too Hot" $\rightarrow$ Excess Motion fracture site $\rightarrow$ Disrupts tissue differentiation to bone

- "Too Cold" $\rightarrow$ No Motion fracture site $\rightarrow$ No bone formation
Risk Factors for Nonunion

Smoking
NSAIDS
Diabetes
Steroids
Age
Infection
Diagnosis Suspected:

Persistent pain

Persistent motion

Plain films persistent gap, minimal callous

Confirm: CT scan
54 y/o male
Bike vs Truck
2 years
6th rib nonunion
35 y/o woman
18 months post MVC
Cough fracture 10 months
Pseudo-Arthrosis
64 year old male
5 years post MVC
54 y/o male
Bike vs Truck
Smoker
54 y/o male
Bike vs Truck
Smoker
54 y/o male
Bike vs Truck
Smoker

2 years
54 y/o male
Bike vs Truck
Smoker
2 years
54 y/o male
Bike vs Truck

2 years

6th rib nonunion
54 y/o male
Bike vs Truck
Smoker
2 years
6th rib nonunion resected
3 months post-injury ? nerve entrapment

9th Rib Displaced Fracture Non-union
10th Rib Fracture
9th Rib

10th Rib

9th Rib

10th Rib
Muscle-sparing Exposure

Lat Dorsi
Intercostal nerve
McGill Pain Questionnaire

Graph showing pain rating index over time:
- Pre-op
- 1 month
- 6 months
- 9 months
- 1 year

Pain Rating Index
SF-36 Survey

Physical Fxn

Pain

Role Phys

Pre-op  1 month  6 months  9 months  1 year
50 y/o fall off roof

Bilateral rib fractures

L2 burst fracture
Admit CT
Rib Fracture Non-Unions
Am Surg 2014

24 patients 4 – 197 months post
1 – 4 nonunions (median 2)

MPQ Present Pain Intensity & Pain Rating Index
SF 36 Phys Func, Role Phys, Social, Bodily Pain, Vitality, Mental, General Health all sig improved

Activity levels sig improved

1 wound infection, 2 screw backouts, one chest wall hernia
Surgical Plan

Resect nonunion

Gap ≤ 1 cm = Titanium Plate

Gap ≥ 1.5 cm = nothing or absorbable plate if unstable

? Grafting/Orthobiologics
62 y/o male 2 years post MCC