Inhaled and oral corticosteroids in chronic lung disease patients with ankle fractures: effect on fracture and wound healing

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Target group

- **Inhaled corticosteroids** (chronic lung disease, long-term, bone mineral density)
- **Oral corticosteroids** (fracture risk, fracture healing, wound healing)

- Retrospective comparative analysis
- Inhaled and oral corticosteroids – **ankle fractures**
- Chronic lung disease (asthma, COPD, emphysema)

Study design

- 2436 patients
- Closed ankle fracture
- Surgical fixation
- Chronic lung disease
- Corticosteroids
- Acute illness

88 met the inclusion criteria

- Comparative arm: age, sex, Lauge-Hansen and surgical fixation requirements

Outcome factors

- **Primary**

- Time to fracture union

- Time to wound healing

- **Secondary**

- Postoperative complications (pain, bleeding, swelling, infection, non-union, mal union, delayed union, compartment syndrome and neurovascular impairment)

- Satisfactory RoM at 4 weeks

- Mobility at last R/V (same before injury, worse)

Results

- **Asthma**
  - 21 patients
  - Steroid inhalers (22)
  - Oral corticosteroids (2)
- **COPD**
  - 60 patients
  - Steroid inhalers (60)
  - Oral corticosteroids (6)
- **Emphysema**
  - 7 patients
  - Steroid inhalers (7)
  - Oral corticosteroids (4)

	Rx group	Control
	n = 88	n = 88
Gender		
Male	46	46
Female	42	42
Age (at time of injury)		
Mean	56	54
Minimum-Maximum	23-75	25-69
Standard deviation	±11.2	±7.9

Primary outcomes	Rx	Rx	Rx	Control
		Inhaled	Oral	
Time to wound healing				
Mean (weeks)	4	3	7	2
Minimum-Maximum	2-7	2-4	3-9	1-2
Standard deviation	±1	±1	±2	±1
Time to union				
Mean (weeks)	12	10	14	9
Minimum-Maximum	8-16	8-10	13-16	8-11
Standard deviation	±2	±1	±2	±1

	Rx g	INH	PO	Control	Rx vs. C	Rx vs. C
	n = 88	n = 76	n = 12	n = 88	Pearson	Fisher
Complications						
Pain (4w)	14	8	**6**	7	.002*	<.001**
Bleeding (4w)	0	0	0	0	-	-
Swelling (4w)	14	7	**7**	7	.003*	<.001**
Superficial inf.	6	2	4	7	.032	.032
Deep infection	7	0	**7**	1	<.001**	<.001**
Mal union	0	0	0	0	-	-
Delayed union	9	2	**7**	2	<.001**	<.001**
Non union	2	1	1	0	-	-
NV impairment	0	0	0	1	-	-
Com. Syndrome	0	0	0	0	-	-

	Rx	INH	PO	Control
	n = 88	n = 76	n = 12	n = 88
Satisfactory RoM (4w)	80	72	**8**	85
Mobility at last R/V				
Same to before injury	85	76	9	87
Dependent – worse	3	0	**3**	1

Secondary outcome factors

- Inhaled corticosteroids – **dose independent**
- No delayed union or non-union
- No delayed nor poor wound healing

- Oral corticosteroids – **dose dependent**
- Delayed union - inhaled corticosteroids ($p<0.001$)
- Delayed union - control group ($p<0.001$)
- Delayed wound healing - inhaled corticosteroids (0.003)
- Delayed wound healing - control group ($p<0.001$)

Relative risks of fracture

- **Asthma**
  - OR 1.04
  - CI 1.00-1.13
  - Lower relative risk
- **COPD**
  - OR 1.18
  - CI 1.14-1.27
  - Higher relative risk
- **Emphysema**
  - OR 1.35
  - CI 1.18-1.44
  - Higher relative risk

Conclusion

- **Inhaled corticosteroids** could not be linked to any adverse event affecting bone or wound healing.
- **Oral corticosteroids** – delayed union and wound healing, postoperative pain and surgical site infection.

- COPD and emphysema patients have higher relative risks than asthmatics.

Thank you

Questions?