



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

Study design

- 88 patients
 - Closed ankle fracture
 - Surgical fixation
 - Chronic lung disease
 - Corticosteroids
 - Acute illness
-
- Comparative arm: age, sex, Lauge-Hansen



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

	Rx group	Rx group	Control	Control	Rx vs. C
	n = 88 (%)	T-test	n = 88 (%)	T-test	Paired Samples Test
Pain (4w)	14 (15.9)	<.001**	7 (8.8)	.007*	.007*
Bleeding (4w)	0 (0.0)	-	0 (0.0)	-	-
Swelling (4w)	14 (15.9)	<.001**	7 (8.8)	.007*	.007*
Infection- superficial	6 (6.8)	.013*	7 (8.8)	.007*	.320
Infection - deep	7 (8.0)	.007*	1 (1.1)	.320	.013*
Mal union	0 (0.0)	-	0 (0.0)	-	-
Delayed union	9 (10.2)	.002*	2 (2.3)	.158	.007*
Non union	2 (2.3)	.158	0 (0.0)	^	.158
Neuro impairment	0 (0.0)	^	1 (1.1)	.320	.320
Comp. syndrome	0 (0.0)	-	0 (0.0)	-	-
LRTI	7 (8.0)	.007*	0 (0.0)	^	.007*
UTI	2 (2.3)	.158	1 (1.1)	.320	.320
DVT	0 (0.0)	-	0 (0.0)	-	-

	Rx group	Rx group	Control	Control	Rx vs. C
	n = 88 (%)	T-test	n = 88 (%)	T-test	Paired Samples Test
RoM (4w)	80 (90.9)	<.001**	85 (96.6)	<.001**	.024*
Last R/V					
Same	85 (96.6)	<.001**	87 (98.9)	<.001**	.158
Worse	3 (3.4)	.083	1 (1.1)	.320	.158

	Rx group	Rx group		Control
		INHs	INHs + PO	
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

	INH (%)		INH+PO (%)		Control (%)
Postoperative complications	(n=76)	T-test	(n=12)	T-test	(n=88)
Pain (4w)	8 (10.5)	.004*	6 (50.0)	.007*	7 (8.8)
Bleeding (4w)	0 (0.0)	-	0 (0.0)	-	0 (0.0)
Swelling (4w)	7 (9.2)	.007*	7 (58.3)	.002*	7 (8.8)
Infection – S	2 (2.6)	.159	4 (33.3)	.039*	7 (8.8)
Infection – D	0 (0.0)	^	7 (58.3)	.002*	1 (1.1)
Mal union	0 (0.0)	-	0 (0.0)	-	0 (0.0)
Delayed union	2 (2.6)	.159	7 (58.3)	.002*	2 (2.3)
Non union	1 (1.3)	.321	1 (8.3)	.339	0 (0.0)
NV impairment	0 (0.0)	^	0 (0.0)	^	1 (1.1)
Comp. syndrome	0 (0.0)	-	0 (0.0)	-	0 (0.0)
LRTI	1 (1.3)	.321	6 (50.0)	.007*	0 (0.0)
UTI	1 (1.3)	.321	1 (8.3)	.339	1 (1.1)
DVT	0 (0.0)	-	0 (0.0)	-	0 (0.0)

	INH (%)		INH+ PO (%)		Control (%)
	(n=76)	T-test	(n=12)	T-test	(n=88)
Satisfactory RoM	72 (94.7)	<.001**	8 (66.7)	.001*	85 (96.6)
Mobility at last R/V					
Same to before injury	76 (100.0)	<.001**	9 (75.0)	<.001**	87 (98.9)
Dependent - worse	0 (0.0)	.321	3 (25.0)	.082	1 (1.1)

Respiratory disease	Odds Ratio	Confidence Interval	Relative risk 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.
- Doses of INHs and oral therapies.

Thank you

Questions?