



Regenerative Procedures and Orthodontics in the Treatment of Severe Intrabony Defects

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Severe periodontal destruction with advanced attachment loss can lead to:



- Tooth malpositioning
- Compromised esthetics
- Compromised occlusal stability
- Compromised long-term prognosis



No higher risk of orthodontic tooth movements
in periodontally compromised teeth following
successfull periodontal therapy



Orthodontic tooth movements after regenerative therapy with enamel matrix derivative (animal study) enhances

Periodontal regeneration:

- 70-80% more cementogenesis, osteogenesis
- No long junctional epithelium, but 70% more Sharpey fibres



Orthodontic tooth movements „into/through“ regeneratively treated sites (bovine derived xenograft) is possible

- no obstruction of tooth movements into BDx sites since PDL is always in between

Only limited data on the interdisciplinary approach of
regenerative and orthodontic therapy:
1y post GTR + 1y post orthodontic therapy

- PD reduction 5.57mm (1y post GTR),
-0.07mm (1 post Ortho)
- CAL gain 5.86mm/ 0,43 mm

sites N=14, patients N=14

2008 Ghezzi et al: Int J Periodontics Restorative Dent; 28(6):559-67.



Regenerative
Procedures and
Orthodontics

Aim

AIM:

To evaluate the outcomes of regenerative periodontal treatment of intrabony defects in conjunction with orthodontic tooth movements



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RATIONALE:

Enhanced bone level gain by additional orthodontic tooth movements

Patient characteristics: N = 48

- men N=19 (39.6%) / women N=29 (60.4%)
- Mean age 45.2 (29-66yrs.)
- smokers N=6 (12.5%)
- average N of treated defects per patient: 10.5

Patient inclusion criteria:

- Complete set of x-rays and data available
- Able to perform adequate OH
- Compliance with SPT regimen
- Smokers and systemic diseases not excluded
- Informed consent

Table 1: Continuous patient characteristics at baseline

| Variable | N | Mean | Std | Med | Min | Q1 | Q3 | Max |
|----------|----|-------|------|-------|-------|-------|-------|-------|
| ndefect | 48 | 10.96 | 6.37 | 10.00 | 2.00 | 6.00 | 17.00 | 24.00 |
| age | 48 | 45.29 | 9.01 | 47.00 | 29.00 | 38.00 | 50.25 | 66.00 |
| nwand | 48 | 1.64 | 0.25 | 1.67 | 1.00 | 1.50 | 1.81 | 2.00 |
| cal.0 | 48 | 8.31 | 1.51 | 8.40 | 4.00 | 7.49 | 9.24 | 12.14 |
| pd.0 | 48 | 5.81 | 1.06 | 5.87 | 3.84 | 4.83 | 6.57 | 8.00 |

Defect characteristics: N = 526

- 1-wall defects: 201 (38,2%)
- 2-wall defects: 325 (61,8%)
- Smokers' defects: 34 (13%)
- Males: 49%
- Mean bone level (to CEJ) at baseline 8.52mm

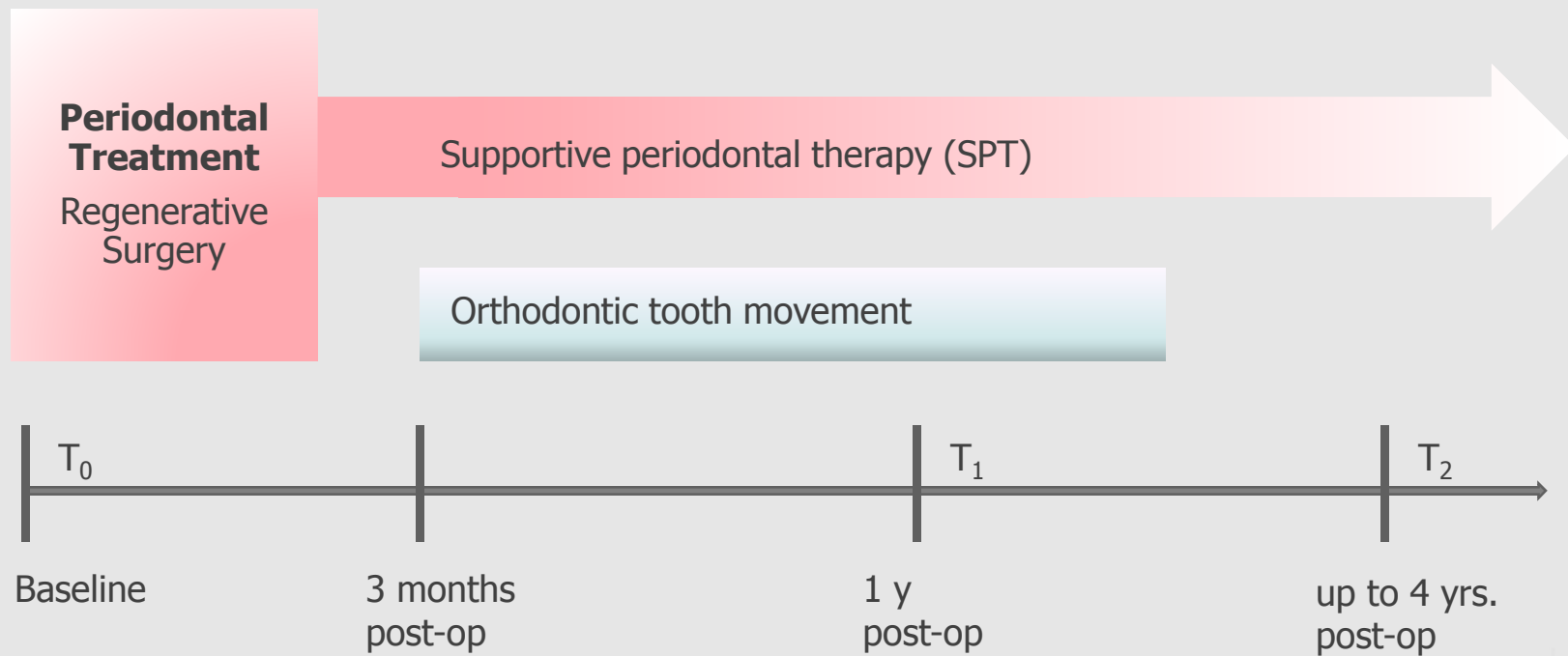
Treatment variations

- Bovine derived mineral
- Bovine derived mineral and collagen membrane
- Bovine derived mineral and enamel matrix derivative (EMD)
- Bovine derived mineral, collagen membrane, EMD
- EMD

| Variable | Level | N | % |
|-------------|----------------|-----|------|
| male | 0 | 267 | 50.8 |
| male | 1 | 259 | 49.2 |
| smoke | 0 | 456 | 86.7 |
| smoke | 1 | 70 | 13.3 |
| nwand | 1 | 201 | 38.2 |
| nwand | 2 | 325 | 61.8 |
| treatment | A.Oss | 124 | 23.6 |
| treatment | B.Oss.Gide | 146 | 27.8 |
| treatment | C.Oss.EMD | 107 | 20.3 |
| treatment | D.Oss.Gide.EMD | 91 | 17.3 |
| treatment | E.EMD | 58 | 11.0 |
| cal.0.strat | A.small | 104 | 19.8 |
| cal.0.strat | B.medium | 321 | 61.0 |
| cal.0.strat | C.large | 101 | 19.2 |
| pd.4mm.0 | 0 | 371 | 70.5 |
| pd.4mm.0 | 1 | 155 | 29.5 |



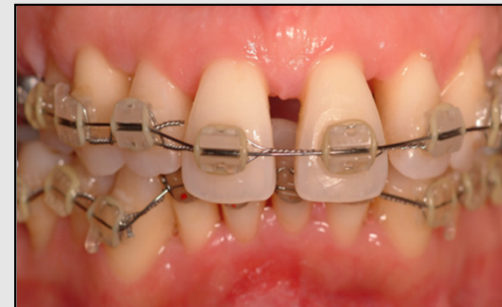
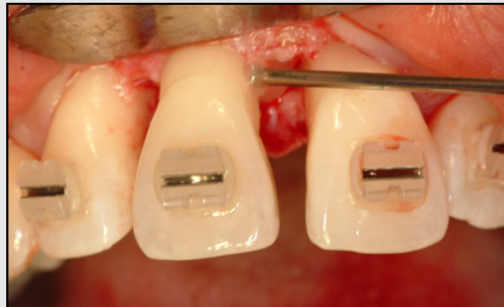
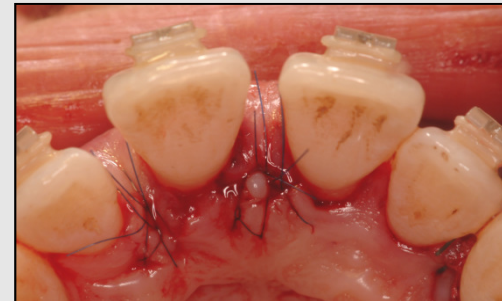
Bone level measurements



Regenerative
Procedures and
Orthodontics

Materials &
Methods

Treatment protocol



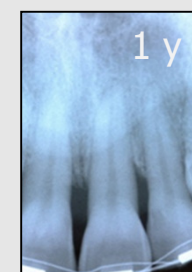
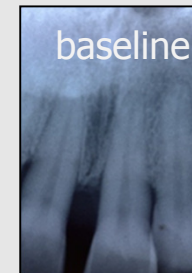
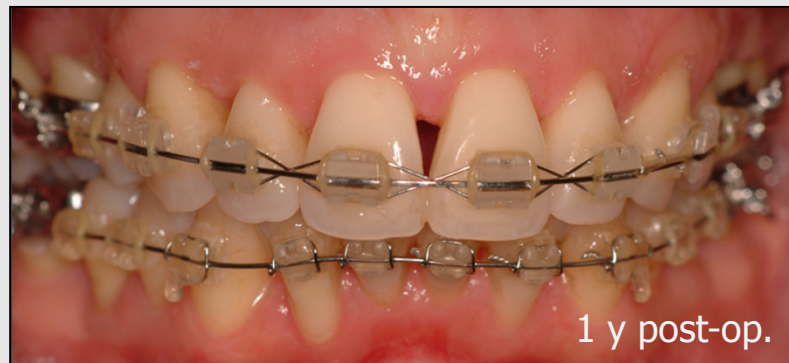


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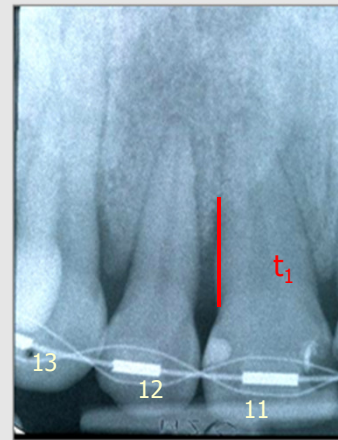
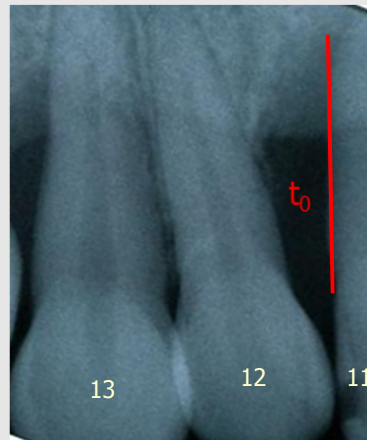
Regenerative
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Measurements

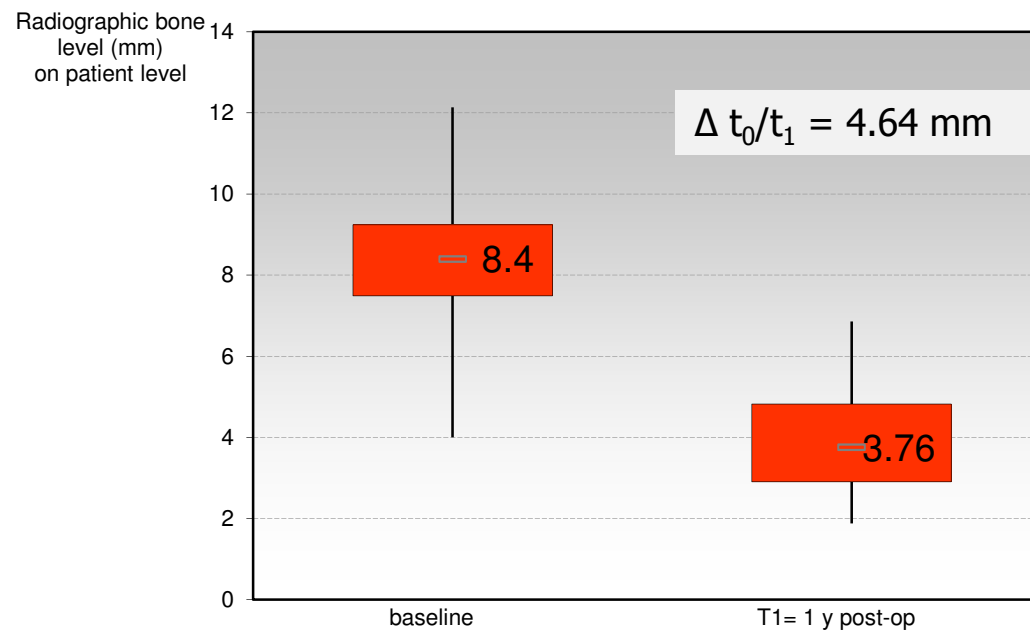


Clinical and Statistical Evaluation

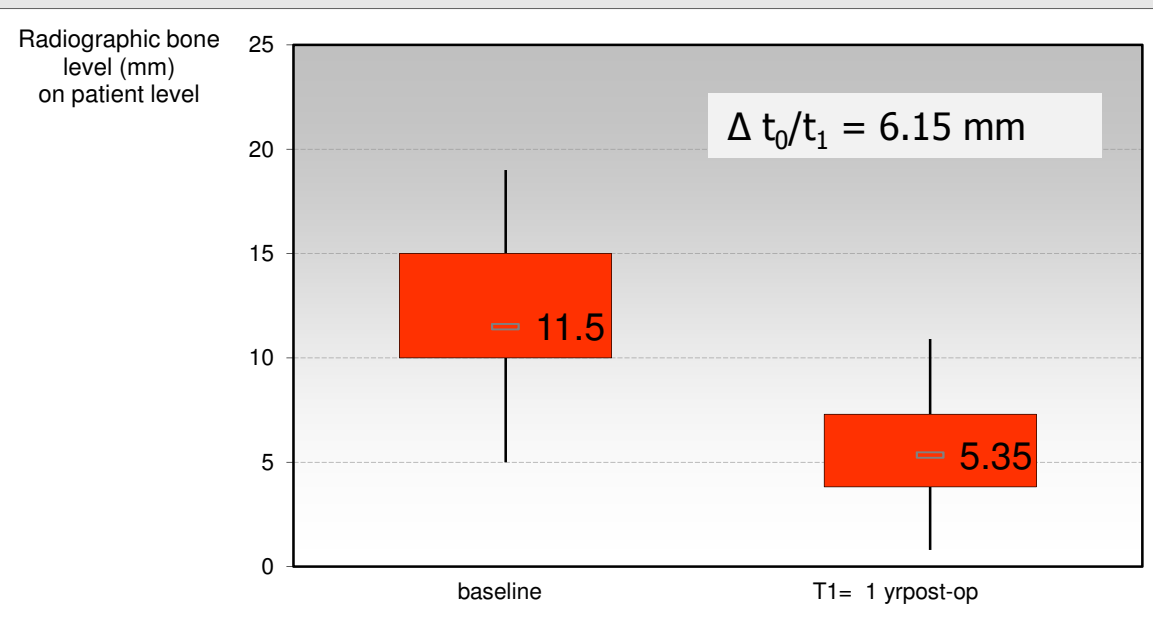


- Baseline (t_0) intra-surgical and radiographic measurement
- Follow-up x-ray at 1 year (t_1) and up to 4 yrs. (t_2)
- X-ray standardization using Image-J[®]
- Bone level measurement from standardized x-ray
- Descriptive analysis of bone level change at t_0/t_1 and t_1/t_2
- Comparison of Tx groups and subgroups

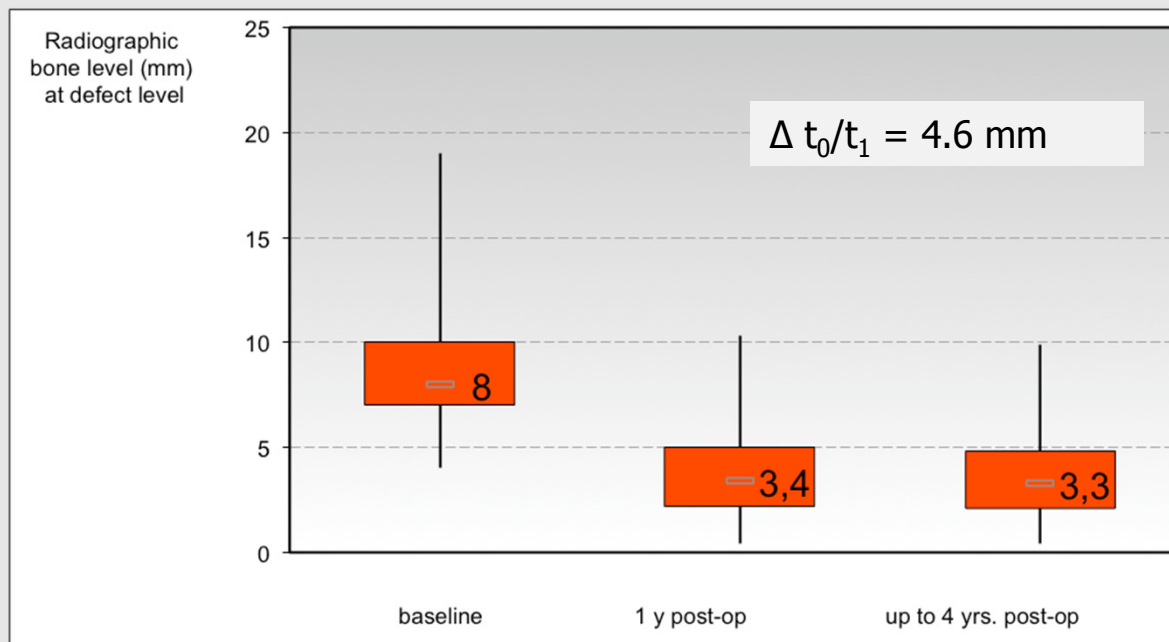
Bone level change on patient level N=48



Bone level change, deepest defect per patient N=48



Radiographic bone level change over time at defect level N=214

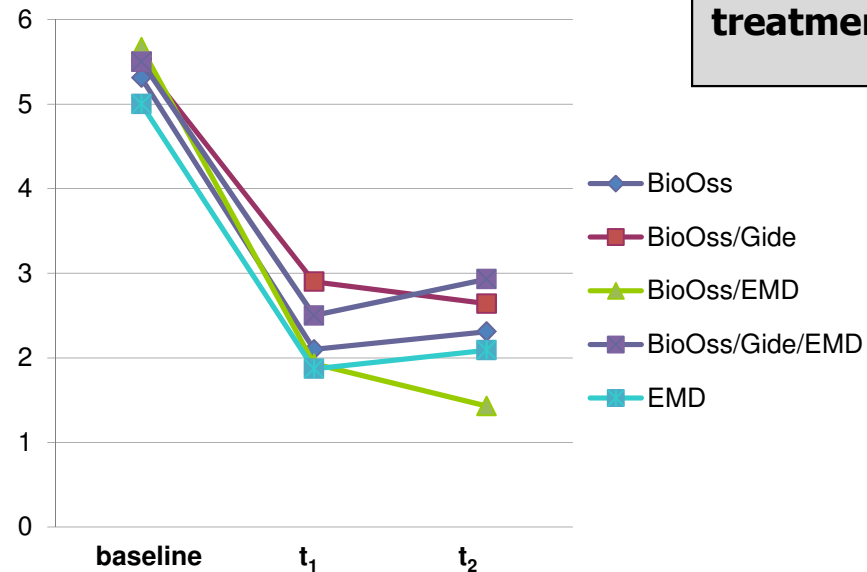


Regenerative
Procedures and
Orthodontics

Results

Bone level change, **small defects** treatment modalities at defect level

Radiographic
bone level (mm)
at defect level



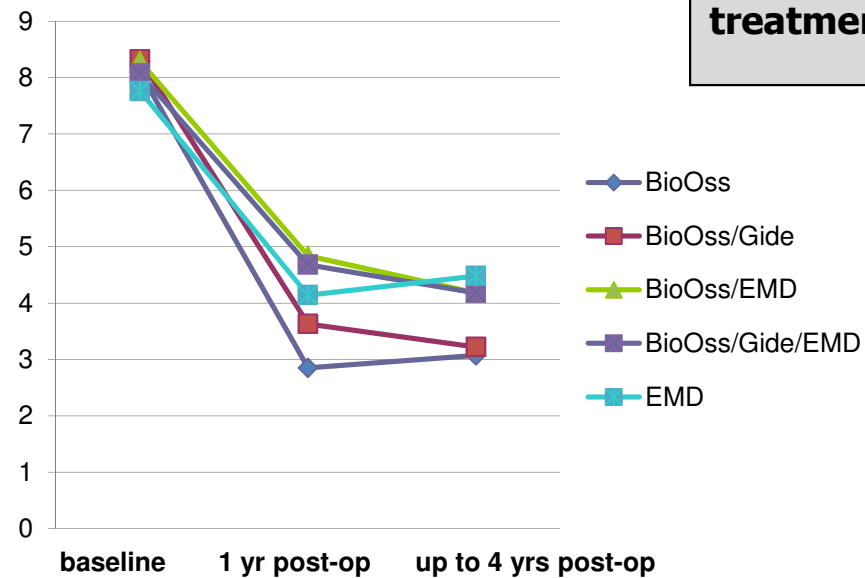
**No differences in
treatment modalities**

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Orthodontics

Results

Bone level change, **medium defects** treatment modalities at defect level

Radiographic
bone level (mm)
at defect level



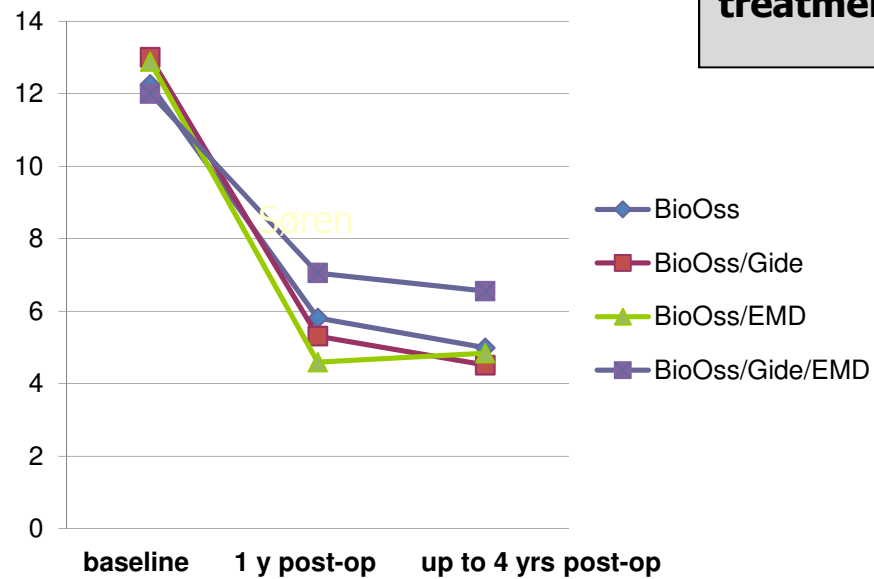
**No differences in
treatment modalities**

Regenerative
Procedures and
Orthodontics

Results

Bone level change, **large defects** treatment modalities at defect level

Radiographic
bone level (mm)
at defect level



**No differences in
treatment modalities**



CONCLUSION

Regenerative periodontal treatment of intrabony defects in conjunction with orthodontic tooth movements leads to **improved bone level** and a **good long-term prognosis**



Regenerative Therapy using Bovine Bone Mineral shows Stable Long-term Results: A Practice-based Study

- Retrospective Clinical Cohort Study -

F. Bröseler C. Tietmann A. Hinz S. Jepsen

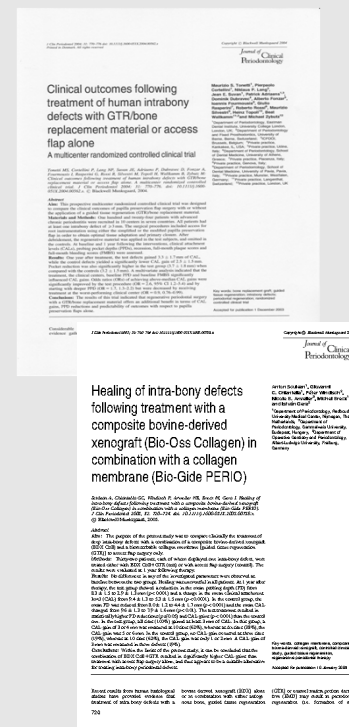
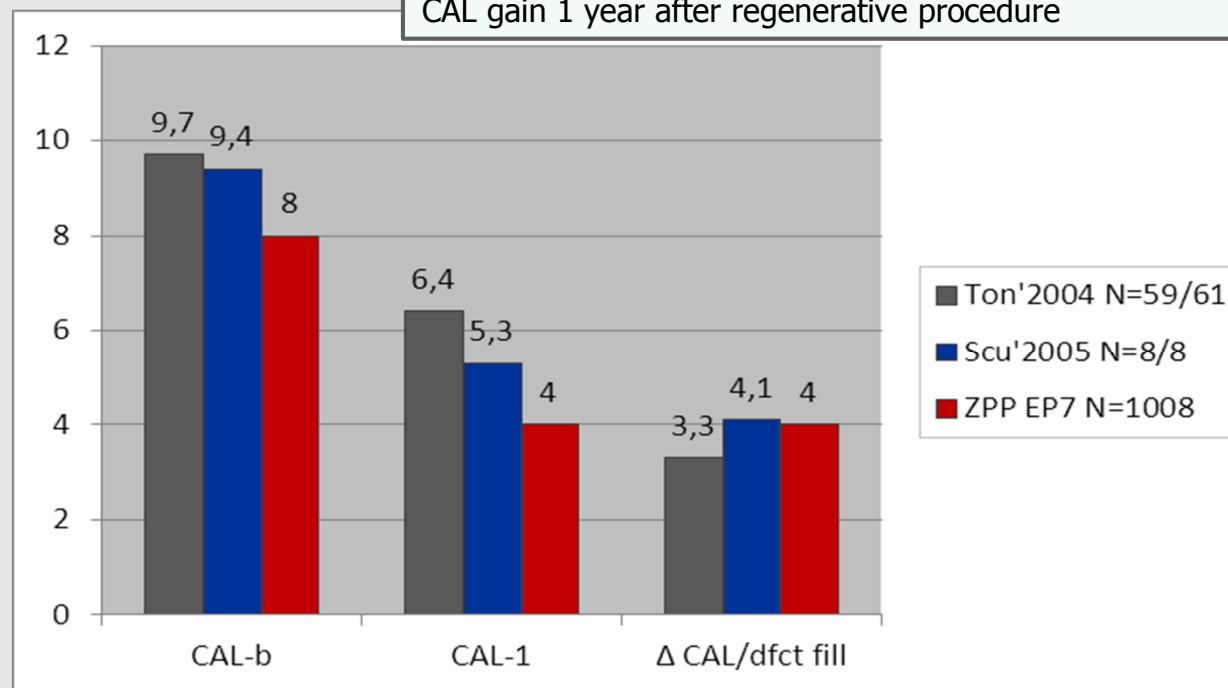
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Regenerative Therapy using Bovine Bone Mineral shows Stable Long-term Results: A Practice-based Study

Regenerative therapy defect reconstruction after 1 y

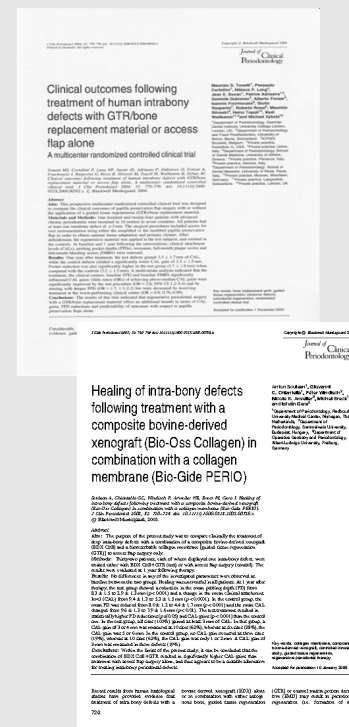
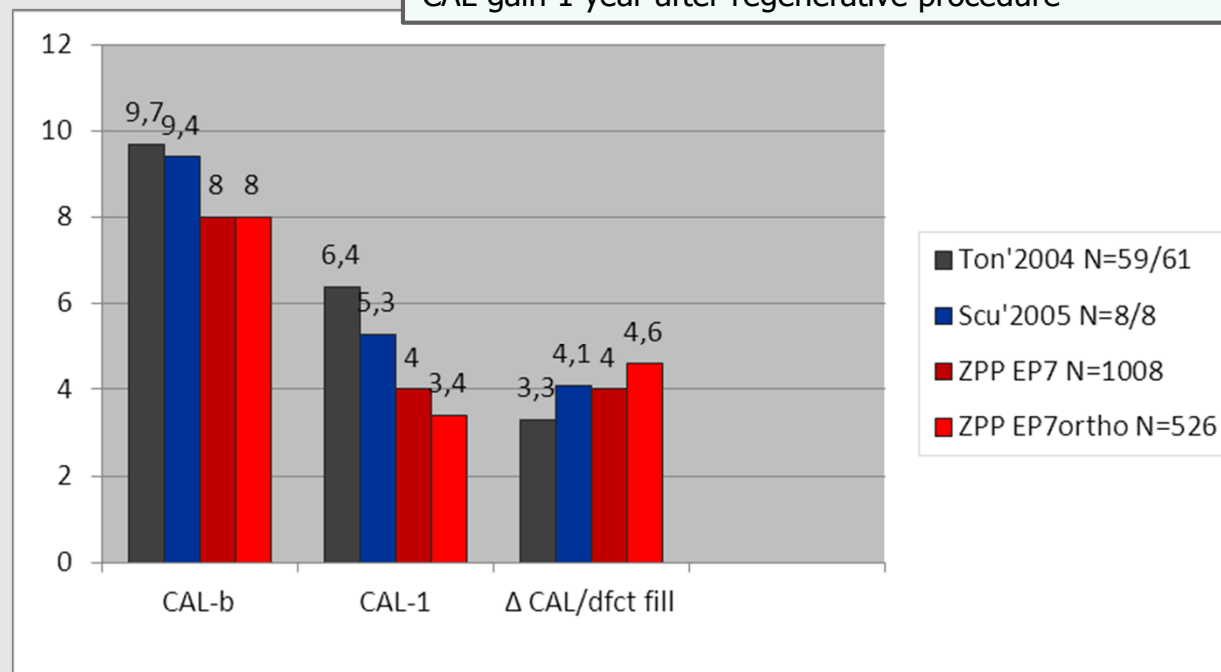
CAL gain 1 year after regenerative procedure



Regenerative Therapy using Bovine Bone Mineral shows Stable Long-term Results: A Practice-based Study

Regenerative therapy defect reconstruction after 1 y

CAL gain 1 year after regenerative procedure



Defect characteristics: N = 1008

1-wall defects 25% / 2-wall defects: 75%
smokers' defects N=292 (29%)

Regenerative treatment using bovine derived bone mineral [BDX]

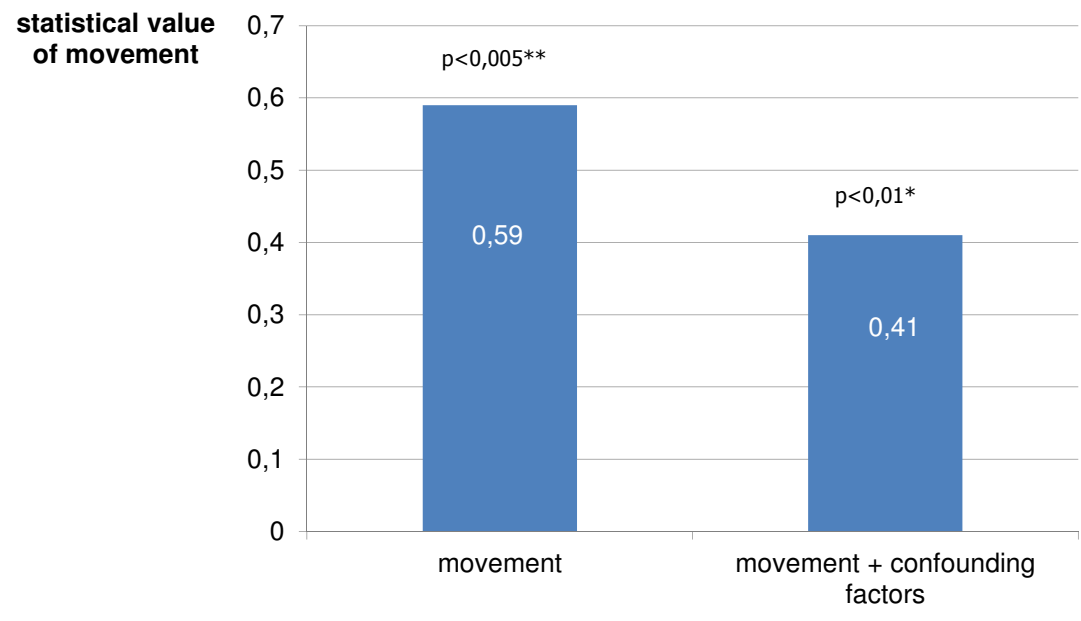
4 treatment variations:

- BDX alone
- BDX + bioresorbable membrane [brM]
- BDX + EMD
- BDX + brM+ EMD

| Variable | N | Mean | Std | Med | Min | Q1 | Q3 | Max |
|----------|------|-------|------|-----|-----|----|----|-----|
| age | 1008 | 49.01 | 9.52 | 49 | 26 | 43 | 54 | 77 |
| smoke | 1008 | 0.29 | 0.45 | 0 | 0 | 0 | 1 | 1 |
| male | 1008 | 0.47 | 0.50 | 0 | 0 | 0 | 1 | 1 |
| nwand | 1008 | 1.74 | 0.44 | 2 | 1 | 1 | 2 | 2 |
| cal.0 | 1008 | 7.84 | 2.33 | 8 | 3 | 6 | 9 | 18 |
| pd.0 | 1008 | 5.82 | 2.02 | 6 | 2 | 4 | 7 | 14 |
| pd.4mm.0 | 1008 | 0.29 | 0.46 | 0 | 0 | 0 | 1 | 1 |



Comparison of bone level change with/without movement (N=526/1008)



**Movement shows
significant impact**

**Confounders (tx,
cal-0-strat, nwand)
do not change the
outcome**

The effect of movement is still considered to be present (p-value $0,41 < 0,05$)
although the estimated difference is lower (0,41 instead of 0,59)



CONCLUSION

The comparison of the outcomes of the two study groups indicate that there may be a **significant positive effect** of **additional orthodontic tooth movements** after regenerative therapy compared to regenerative therapy alone.

Study Coworkers:

Tamar **Axelrad**, Student, Data Collection & Radiographic Measurements

Frank **Bröseler**, Periodontist, Therapy Supervision & Surgery

Nadja **Sadr**, Dental Hygienist (ZMF), Maintenance Therapy

Deborah **Meisen**, Dental Hygienist (ZMP), Maintenance Therapy

Melanie **Franke**, Dentist, Postgraduate Periodontology, Graphics

Søren **Jepsen**, Chair of Perio Dpt., Univ. Bonn, Scientific Supervision

Michael **Mayer**, Consult AG, Bern/CH, Statistical Analysis