PAUL
Proximal Abducting ULnar Osteotomy for Elbow Medial Compartment Disease

Early clinical experience

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Medial compartment syndrome of the elbow

- End result of FCP and OCD of the Elbow
- Due to joint incongruity
- Short radius or short ulna
- Cartilage loss and bone eburneation
- Progressive OA
- Friction, heating, pain
Medial compartment syndrome of the elbow

- Collapse of the medial compartment
- Limb adduction
- Increased medial load
- Medial shift of the WB
- Vicious circle
- Any joint treatment is unrewarding
Medial compartment syndrome of the elbow

- Elbow incongruity could be corrected or improved only in the growing dog, before joint modification occurred.
- In the adult dog, shifting of the WB laterally causing limb abduction could decrease the medial loading.
- Palliative treatment:
  - Sliding Humeral Osteotomy
  - Torsional Humeral Osteotomy
  - Proximal Ulna Osteotomy
  - Other osteotomies?
Ingo Pfeil pilot study developed with Slobodan Tepic

- proximal ulna osteotomy
- stepped plate
- causing abduction
- shifting wb from medial to lateral
- Clinical trial
- ~30 Veterinary Hospitals involved
- Dedicated ALPS 10 stepped plates
- With 2, 3 (and 4) mm steps
- Corresponding to 4°, 6° and 8° of abduction
- Plus about 4°- 5° due to natural ulna curvature
- End lateral shift of 8° to 11° (with 2 and 3 mm steps)
- Personal experience: 21 elbows, 20 dogs, from May 2010
Case Selection

- Dogs of any age (1 year to 9 years)
- Severe OA developed from FCP-OCD
- Medial Compartment Syndrome
- Unresponsive to conservative or arthroscopy management
- Palliative treatment
- Offering expected variable improvement or no improvement, age dependant, but no worsening
- Early treatment?
Case Selection

- Young dogs

Golden, M, 1.5 yrs.

Labrador, M, 1 yr.
Case Selection

- Mature dogs

Golden, M, 4 yrs.

Rottweiler, F, 7 yrs.
Case Selection

- Planning:
  - arthroscopy to confirm medial compartment erosion and cartilage integrity in the lateral compartment

Yoghi, Labrador, F, 2 yrs., 36 kg
Case Selection

- Planning:
  - Arthroscopy to confirm medial compartment erosion and cartilage integrity in the lateral compartment

Blade, Labrador, M, 5 yrs., 35 kg
Case Selection

- Inclusions:
  - in most of the cases the lateral compartment is not involved

GSD, M, 7 yrs, 42 kg
Courtesy B. Van Ryssen
Case Selection

- Exclusion:
  - end-stage OA
  - medial & lateral joint collapse
  - > 9 years of age

Labrador, F, 8 yrs, 38 kg
Case Selection

- Exclusion:
  - Radial head erosion

Labrador, M, 11 mo., 36 kg
Case Selection

- Exclusion:
  - FCP without medial compartment erosion

Rottweiler, M, 8 mo.

Tuesday, May 1, 12
Case Selection

- Planning:
  - radiographic study and measurements
Case Selection

- Simplified Planning:
  - radiographic study and measurements
  - mechanical proximal medial R/U angle
    - normal: $81.5 \pm 2.5$
    - $< 80^\circ \Rightarrow 3$ mm step plate
    - $> 80^\circ \Rightarrow 2$ mm step plate

![X-ray Image with Angular Measurement](Image)
Visual Planning:

- video clips
- still frame from front
- measure forelimb adduction
- degrees of correction related to amount of internal limb adduction, & limb size

Tobia, Golden Retriever, M, 1.5 yrs.
Surgery

- Caudo-lateral approach
- Muscle attachment & periosteal preservation
- Measurement from radial head

\[ 4 \text{ cm} \]
Surgery

- Orthogonal osteotomy, in medial direction, wet sponges
Surgery

- Orthogonal osteotomy, in medial direction, wet sponges
Surgery

- Temporary fixation with forceps, creating a small caudal step and centring the plate distally
Surgery

- APLS PAUL plate fixation
Surgery

- APLS PAUL plate fixation, with small caudal tilt prox. ulna
Surgery

• Post-op radiograph
Surgery

- Post-op radiographs
- M-L
- Cr-Cd

- FUs at 2 and 6 months
- then yearly
Clinical cases

- **Breeds**
  - Labrador: 66%
  - Golden: 14%
  - Rottweiler: 14%
  - GSD: 6%
  - Am. Staffordshire: 5%
  - Bernese: 4%

Total: 21 elbows

Tuesday, May 1, 12
Clinical cases

- **Age**

  - 1-2 yrs: 47%
  - 3-4 yrs: 14%
  - 5-6 yrs: 9%
  - 7-8 yrs: 19%
  - > 9 yrs: 9%

  Total: 21 elbows
Clinical cases

- Plate size

<table>
<thead>
<tr>
<th>Plate Size</th>
<th>Cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 mm</td>
<td></td>
<td>57%</td>
</tr>
<tr>
<td>3 mm</td>
<td></td>
<td>38%</td>
</tr>
<tr>
<td>4 mm</td>
<td></td>
<td>5%</td>
</tr>
</tbody>
</table>

Total: 21 elbows
Clinical cases

- **Arthroscopy**

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous</td>
<td>42%</td>
</tr>
<tr>
<td>Contemporary</td>
<td>42%</td>
</tr>
<tr>
<td>No</td>
<td>16%</td>
</tr>
</tbody>
</table>

Total: 21 elbows
Clinical cases

- **Gap**

  - Graft: 10%
  - Collagen: 52%
  - No: 38%

Total: 21 elbows
Clinical cases

FU

- 1-2 months: 100%
- 6 months: 42%
- 1 year: 47%

Total: 21 elbows
### Clinical cases

- **Outcome (physical evaluation and owner’s satisfaction)**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Great improvement</td>
<td>26%</td>
</tr>
<tr>
<td>Improvement</td>
<td>52%</td>
</tr>
<tr>
<td>Same as before</td>
<td>16%</td>
</tr>
<tr>
<td>Worsened</td>
<td>5%</td>
</tr>
</tbody>
</table>

**Total: 21 elbows**
Clinical cases

Outcome

- **Great improvement**: 50% - 10 dogs, 50% - 2 dogs, 14% - 7 dogs
- **Improvement**: 50% - 10 dogs, 28% - 2 dogs
- **Same as before**: 43% - 2 dogs
- **Worsened**: 14% - 2 dogs

Total: 21 elbows
Clinical cases

- Complications: minor 9.5% - major 19%

<table>
<thead>
<tr>
<th>Condition</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broken plate</td>
<td>15%</td>
</tr>
<tr>
<td>(Prototype plate)</td>
<td></td>
</tr>
<tr>
<td>Delayed union</td>
<td>9.5%</td>
</tr>
<tr>
<td>Implant removal</td>
<td>4.7%</td>
</tr>
</tbody>
</table>

Total: 21 elbows
Clinical cases

Rottweiler, F, 7 yrs., FU 6 mo.

- Complications:
  - plate breakage
  - prototype plate only
Clinical cases

Rottweiler, F, 7 yrs., FU 6 mo., delayed union
Clinical cases

American Staffordshire, M, 4 yrs., FU 9 mo., implant removal
Other described complications:

- non-union
- infection
- screw loosening
**Clinical cases**

- Other described complications:
  - radial osteotomy
  - wrong plate
  - fixation distally
Clinical cases

Tobia, Golden Retriever, M, 1.5 yrs., 36 kg
3° chronic left lameness, FCP 5 mo. before
Tobia, Golden Retriever, M, 1.5 yrs., 36 kg
3° chronic left lameness
Clinical cases

Tobia, Golden Retriever, M, 1.5 yrs., 36 kg
1 month p.o. PAUL only 3 mm, limb abduction
Tobia, Golden Retriever, M, 1.5 yrs., 36 kg
1 month p.o., limb abduction
Clinical cases

Tobia, Golden Retriever, M, 1.5 yrs., 36 kg
1 month p.o., limb abduction
Clinical cases

pre-op

1 mo. post-op

Tobia, Golden Retriever, M, 1.5 yrs., 36 kg
1 month p.o., limb abduction

slow motion
Discussion

- Palliative treatment
- Promising preliminary results
- Client satisfaction
- Limited risk of complications
- Further evaluations are needed in long term
Thank you for the attention

Girl, Malaysian tiger, unique tiger in the word with a THR