Ulna osteotomies for ED in growing dogs

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Elbow Dysplasia

Why ulna osteotomies in elbow dysplasia?
Elbow Dysplasia

Why ulna osteotomies in elbow dysplasia?

to correct joint incongruinity and reduce ED pathogenesis.
Elbow Dysplasia

Why ulna osteotomies in elbow dysplasia?

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before the establishment of OA
Elbow Dysplasia

Why ulna osteotomies in elbow dysplasia?

to correct joint incongruity and reduce ED pathogenesis

before the establishment of OA

at 4 to 6 months of age
Elbow Dysplasia

joint incongruity:
  - longer or shorter radius, or bi-phased growth

Alteration of enchondral growth and asynchronous growth of radius & ulna
Elbow Dysplasia

joint incongruity

uneven distribution of weight bearing forces on joint surfaces

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Elbow Dysplasia

un-uniform distribution of weight bearing forces on joint surfaces

jaline cartilage tolerates a maximal compression of 1 kg / mm²
Elbow Dysplasia

un-uniform distribution of weight bearing forces on joint surfaces

jaline cartilage tolerates a maximal compression of 1 kg / mm²

- condromalacia
- fibrillation
- fissuration
- erosion
- OA
Elbow Dysplasia

un-uniform distribution of weight bearing forces on joint surfaces

- FCP
- short radius theory
- A. Wind 1978
Elbow Dysplasia

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Elbow Dysplasia

un-uniform distribution of weight bearing forces on joint surfaces

- FCP
- long radius theory
- S. Lozier 2006
- when the AP is fused
Elbow Dysplasia

un-uniform distribution of weight bearing forces on joint surfaces

✓ FCP
✓ long radius theory
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un-uniform distribution of weight bearing forces on joint surfaces

✓ FCP
✓ long radius theory
✓ S. Lozier 2006
✓ when the AP is fused

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Elbow Dysplasia

un-uniform distribution of weight bearing forces on joint surfaces

- UAP
- long radius
- early growing phase
- when the AP is not yet fused
Elbow Dysplasia

un-uniform distribution of weight bearing forces on joint surfaces

- UAP
- long radius
- early growing phase
- when the AP is not yet fused

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Elbow Dysplasia

asynchronous growth of radius & ulna
Elbow Dysplasia

asynchronous growth of radius & ulna

- both long and short radius can develop
Elbow Dysplasia

asynchronous growth of radius & ulna

- both long and short radius can develop
- both conditions can develop in the same dog, at different times
Elbow Dysplasia

asynchronous growth of radius & ulna

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- UAP first (long radius) and FCP later (long or short radius)
Elbow Dysplasia

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Elbow Dysplasia

Conventional Treatment
Elbow Dysplasia

Conventional Treatment

✓ removal of osteo-cartilaginous fragments
Elbow Dysplasia

Conventional Treatment

✓ removal of osteo-cartilaginous fragments
✓ joint debridement and washing
Elbow Dysplasia

Conventional Treatment

- removal of osteo-cartilaginous fragments
- joint debridement and washing
- mini-arthroscopy
Elbow Dysplasia

Conventional Treatment

- removal of osteo-cartilage fragments
- joint debridement and washing
- mini-arthrotomy
- arthroscopy
Elbow Dysplasia

In every type of elbow dysplasia with persistence of joint incongruity

- overloading of one elbow compartment
- progression of OA
  - independently by the removal of osteo-cartilaginious fragments (FCP, OCD, UAP)
  - independently by arthroscopy vs arthroscopy treatment
In every type of elbow dysplasia with persistence of joint incongruity, the end result looks similar both after surgical treatment and after conservative management. 

- progression of OA
Elbow Dysplasia

overloading of one elbow compartment
progression of OA

Great Dane, FU 3 yrs.
AP removal at 9 mo. of age

Mastiff, FU 4 yrs.
arthroscopy for OGD at 7 mo. of age
Elbow Dysplasia

overloading of one elbow compartment
progression of OA

Ronny, Labrador, arthroscopy for FCP at 7.5 mo. of age

FU 6 mo.
**Elbow Dysplasia**

- Overloading of one elbow compartment
- Progression of OA

*Carmen, Labrador, 7 mo., FCP conservative management*

FU 6 mo. Sunday, April 19, 2009
Elbow Dysplasia
Surgical removal of joint fragments is not rewarding in avoiding OA progression
Elbow Dysplasia

- Surgical removal of joint fragments is not rewarding in avoiding OA progression
- How could we limit or avoid OA progression?
Surgical removal of joint fragments is not rewarding in avoiding OA progression

How could we limit or avoid OA progression?

Addressing incongruity before OA?
Elbow Dysplasia

- Surgical removal of joint fragments is not rewarding in avoiding OA progression
- How could we limit or avoid OA progression?
- Addressing incongruity before OA?
- When?
Elbow Dysplasia

- Surgical removal of joint fragments is not rewarding in avoiding OA progression
- How could we limit or avoid OA progression?
- Addressing incongruity before OA?
- When?
- At very early signs of ED
Surgical removal of joint fragments is not rewarding in avoiding OA progression

How could we limit or avoid OA progression?

Addressing incongruity before OA?

When?

At very early signs of ED

Is it possible to pick-up early signs of ED?
Surgical removal of joint fragments is not rewarding in avoiding OA progression.

How could we limit or avoid OA progression?

Addressing incongruity before OA?

When?

At very early signs of ED

Is it possible to pick-up early signs of ED?

Is it possible to modify the disease process?
E.D. - early diagnosis
E.D. - early diagnosis

Different forms of ED starts at the 4th month of age +/- 2-3 weeks
E.D. - early diagnosis

Different forms of ED starts at the 4th month of age +/- 2-3 weeks

Routine radiological examination in predisposed breeds at 4 to 5 months of age
Different forms of ED starts at the 4th month of age +/- 2-3 weeks

Routine radiological examination in predisposed breeds at 4 to 5 months of age

Immediate radiological examination in case of lameness
E.D. - early diagnosis

- Different forms of ED starts at the 4th month of age +/- 2-3 weeks
- Routine radiological examination in predisposed breeds at 4 to 5 months of age
- Immediate radiological examination in case of lameness
- Standard views
E.D. - early diagnosis

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- Routine radiological examination in predisposed breeds at 4 to 5 months of age
- Immediate radiological examination in case of lameness
- Standard views
- Excellent radiographic quality
E.D. - early diagnosis

- Different forms of ED starts at the 4th month of age +/- 2-3 weeks
- Routine radiological examination in predisposed breeds at 4 to 5 months of age
- Immediate radiological examination in case of lameness
- Standard views
- Excellent radiographic quality
- Look for signs of joint incongruity and bone sclerosis
E.D. - early diagnosis

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- Routine radiological examination in predisposed breeds at 4 to 5 months of age
- Immediate radiological examination in case of lameness
- Standard views
- Excellent radiographic quality
- Look for signs of joint incongruity and bone sclerosis
- Highlight minimal details
E.D. - early diagnosis

- Different forms of ED starts at the 4th month of age +/- 2-3 weeks
- Routine radiological examination in predisposed breeds at 4 to 5 months of age
- Immediate radiological examination in case of lameness
- Standard views
- Excellent radiographic quality
- Look for signs of joint incongruity and bone sclerosis
- Highlight minimal details
- Repeat the examination after 2-3 wks in case of doubt or CT
E.D. - early diagnosis

- M-L neutral view (mild extension)
- M-L flexed view (AP)
- Cr-Cd view with 15° of pronation
E.D. - early diagnosis

- Normal aspect

Petar, Labrador, M, 4 mo.
FCP-OCD - early diagnosis

- Sub-trochlear ulnar sclerosis
- Radio-Humeral and Radio-Ulnar incongruity
- < bone density of coronoid region
- Osteophytes

Canev, Labrador, M, 4,5 mo.
FCP-OCD - early diagnosis

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- Radio-Humeral and Radio-Ulnar incongruity
- < bone density of coronoid region
- Osteophytes

Canev, Labrador, M, 4.5 mo.
FCP-OCD - early diagnosis

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FCP-OCD - early diagnosis

Bone sclerosis
FCP-OCD - early diagnosis

- Bone sclerosis
  - joint surface overloaded
FCP-OCD - early diagnosis

- Bone sclerosis
  - joint surface overloaded
  - load transmitted to underlying bone structure
FCP-OCD - early diagnosis

- Bone sclerosis

- joint surface overloaded

- load transmitted to underlying bone structure

- bone response = increased bone density
Bone sclerosis

- joint surface overloaded
- load transmitted to underlying bone structure
- bone response = increased bone density
- witness of cartilage damage
Bone sclerosis

- joint surface overloaded
- load transmitted to underlying bone structure
- bone response = increased bone density
- witness of cartilage damage
- precursor sign of medial coronoid fragmentation
FCP-OCD - early diagnosis

Bone sclerosis

- joint surface overloaded
- load transmitted to underlying bone structure
- bone response = increased bone density
- witness of cartilage damage
- precursor sign of medial coronoid fragmentation
- easy to recognize
FCP-OCD - early diagnosis

Elbow incongruity
FCP-OCD - early diagnosis

- Elbow incongruity
  - Controversial topic
Elbow incongruity

Controversial topic

Is the congruity/incongruity an objective evaluation?
Elbow incongruity

- Controversial topic
- Is the congruity/incongruity an objective evaluation?
- Is any incongruity always pathological?
Elbow incongruity

- Controversial topic
- Is the congruity/incongruity an objective evaluation?
- Is any incongruity always pathological?
- Joint congruity can be influenced by positioning (flexion, extension, traction) both with Radiography and CT examinations
Elbow incongruity

- Controversial topic
- Is the congruity/incongruity an objective evaluation?
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- Physiological elbow laxity in growing dogs
Elbow incongruity

- Controversial topic
- Is the congruity/incongruity an objective evaluation?
- Is any incongruity always pathological?
- Joint congruity can be influenced by positioning (flexion, extension, traction) both with Radiography and CT examinations
- Physiological elbow laxity in growing dogs
- Elbow positioning should be as neutral as possible (standing)
FCP-OCD - early diagnosis

- How can we distinguish a true incongruity from a positioning artifact?
How can we distinguish a true incongruity from a positioning artifact?

- In case of positioning artifact no signs of joint disease should be seen (bone sclerosis, osteophytes)
How can we distinguish a true incongruity from a positioning artifact?

- in case of positioning artifact no signs of joint disease should be seen (bone sclerosis, osteophytes)
- in case of true incongruity signs of joint disease due to cartilage overloading will be seen (bone sclerosis and later osteophytes)
How can we distinguish a true incongruity from a positioning artifact?

- In case of positioning artifact no signs of joint disease should be seen (bone sclerosis, osteophytes)
- In case of true incongruity signs of joint disease due to cartilage overloading will be seen (bone sclerosis and later osteophytes)

Visible incongruity + sclerosis = true incongruity
How can we distinguish a true incongruity from a positioning artifact?

visible incongruity + sclerosis = true incongruity
FCP-OCD - early diagnosis

Rosa, Golden F, 5 mo.
FCP-OCD - early diagnosis

Are early signs (bone sclerosis) always associated to OA progression?

Rosa, Golden F, 5 mo.
Are early signs (bone sclerosis) always associated to OA progression?

Sequential recheck in conservatively managed cases
Are early signs (bone sclerosis) always associated to OA progression?

- Sequential recheck in conservatively managed cases
- Criterium of similarity (breed, age, X-ray signs)

Rosa, Golden F, 5 mo.
FCP-OCD - early diagnosis

- Are early signs (bone sclerosis) always associated to OA progression?
- Sequential recheck in conservatively managed cases
- Criterium of similarity

Rosa, Golden F, 5 mo.  
Rosa, Golden F, 7 mo.
Olmo,
Labrador M,
6.5 mo.

FCP- early diagnosis
Olmo, Labrador M, 6.5 mo.

Olmo, Labrador M, 2 yrs.
Lady, Golden F, 3.5 mo. suspect of sclerosis

FCP - early diagnosis
FCP - early diagnosis

Lady, Golden F, 3.5 mo. suspect of sclerosis

Lady, Golden F, 4.5 mo. recheck after 4 weeks

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FCP- early diagnosis

S. Bernard, M, 6 mo. suspect

CT
Gritt, Labrador, M 3.5 mo. suspect of sclerosis and flattening of medial condyle
Gritt, Labrador, M 3.5 mo. suspect of sclerosis and flattening of medial condyle

recheck after 3 weeks

OCD - early diagnosis
Czech Wolf, M., 4 mo.

M-L flexed view
UAP - early diagnosis

✓ Maximum age of AP bony fusion:

- GSD and other large breeds: 4 months +/- 2 wks
- Great dane and other giant breeds: 5-6 months

GSD, F., 4 mo. and 5 days
Time progression of UAP

- lack of bony fusion of AP
- persistent incongruity with longer radius
- separation of AP
- erosion of end plates
- mobilization
- synovitis and severe OA
FCP - early diagnosis & treatment

Treatment strategies in 4-6 months old puppies:

- in case of clear early signs of starting FCP:
Treatment strategies in 4-6 months old puppies:

- in case of clear early signs of starting FCP:
  1. distal DUO only, asap (even bilateral if indicated)
FCP - early diagnosis & treatment

Treatment strategies in 4-6 months old puppies:

- in case of clear early signs of starting FCP:
  1. distal DUO only, asap (even bilateral if indicated)
  2. later, if required, joint treatment (arthroscopy, arthrotomy)
Treatment strategies in 4-6 months old puppies:

- in case of clear early signs of starting FCP:
  1. distal DUO only, asap (even bilateral if indicated)
  2. later, if required, joint treatment (arthroscopy, arthrotomy)
  3. alternatively, conservative management and periodical rechecks
FCP - early diagnosis & treatment

Treatment strategies in 4-6 months old puppies:

- in case of clear early signs of starting FCP:
  1. distal DUO only, asap (even bilateral if indicated)
  2. later, if required, joint treatment (arthroscopy, arthrotomy)
  3. alternatively, conservative management and periodical rechecks

- in case of uncertain early signs of starting FCP:
Treatment strategies in 4-6 months old puppies:

- in case of clear early signs of starting FCP:
  1. distal DUO only, asap (even bilateral if indicated)
  2. later, if required, joint treatment (arthroscopy, arthrotomy)
  3. alternatively, conservative management and periodical rechecks

- in case of uncertain early signs of starting FCP:
  1. repeat radiographic examination after 3 weeks or CT
Distal DUO - dynamic ulna osteotomy
Distal DUO - dynamic ulna osteotomy

✓ distal ulna ostectomy without fixation
Distal DUO - dynamic ulna osteotomy

- distal ulna ostectomy without fixation
- to disconnect radius & ulna
Distal DUO - dynamic ulna osteotomy

✓ distal ulna ostectomy without fixation
✓ to disconnect radius & ulna
✓ to achieve a spontaneous ulna shortening or lengthening
Distal DUO - dynamic ulna osteotomy

- distal ulna ostectomy without fixation
- to disconnect radius & ulna
- to achieve a spontaneous ulna shortening or lengthening
- in balance with radius length
Distal DUO - dynamic ulna osteotomy

✓ distal ulna ostectomy without fixation
✓ to disconnect radius & ulna
✓ to achieve a spontaneous ulna shortening or lengthening
✓ in balance with radius length
✓ to restore or improve joint congruency
Distal DUO - dynamic ulna osteotomy

- Distal ulna ostectomy without fixation
- To disconnect radius & ulna
- To achieve a spontaneous ulna shortening or lengthening
- In balance with radius length
- To restore or improve joint congruency
- Useful in FCP and OCD with joint incongruity
Distal DUO - dynamic ulna osteotomy

- distal ulna ostectomy without fixation
- to disconnect radius & ulna
- to achieve a spontaneous ulna shortening or lengthening
- in balance with radius length
- to restore or improve joint congruency
- useful in FCP and OCD with joint incongruity
- limited to young growing dogs only (up to 6 mo. of age)
Distal DUO - dynamic ulna osteotomy

- distal osteotomy
- 1 inch proximal to the growth line
- 1/5 inch ostectomy
- sliding effect
- ulna shortening or lengthening
Distal DUO - dynamic ulna osteotomy

- distal osteotomy
- 1 inch proximal to the growth line
- 1/5 inch ostectomy
- sliding effect
- ulna shortening or lengthening
Distal DUO - dynamic ulna osteotomy

- adaptation of the interosseous ligament to wb forces (up to 6-7 mo.)

- wb forces and muscular pull realign joint components spontaneously

- improved joint congruity
Distal DUO - dynamic ulna osteotomy

- short radius
Distal DUO - dynamic ulna osteotomy

- short radius

1 inch
Distal DUO - dynamic ulna osteotomy

- short radius
Distal DUO - dynamic ulna osteotomy

- short radius

1 inch
Distal DUO - dynamic ulna osteotomy

- long radius
Distal DUO - dynamic ulna osteotomy

- long radius
Distal DUO - dynamic ulna osteotomy

- long radius
Distal DUO - dynamic ulna osteotomy

- long radius
Distal DUO - dynamic ulna osteotomy

Ulna approach:
- incision between tendon of digital extensor and tendons of deep digital flexor/ulnaris lateralis, over the bone
- incision and elevation of periosteum
- 1 inch proximal to the growth physis
Distal DUO - dynamic ulna osteotomy

- with a rongeur, subperiosteal ostectomy, soft bone
- NOT with an oscillating saw
Distal DUO - dynamic ulna osteotomy

- with a rongeur, subperiosteal ostectomy, soft bone
- NOT with an oscillating saw
Distal DUO - dynamic ulna osteotomy

- low morbidity
- early weight bearing
- walking on a leash for 1 mo.
Distal DUO - dynamic ulna osteotomy

1 year FU

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FCP - early diagnosis & treatment

Distal DUO - dynamic ulna osteotomy

Newfoundland, Camilla, 6 mo.
Grade 2 lameness, INC + sclerosis
DUO only

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FCP - early diagnosis & treatment

Distal DUO - dynamic ulna osteotomy

Newfoundland, Camilla, 14 mo., 8 mo. FU, no lameness
DUO only
FCP - early diagnosis & treatment

Distal DUO - dynamic ulna osteotomy

Newfoundland, Camilla, 14 mo.
8 mo. FU, no lameness
DUO only
ED - early diagnosis & treatment

Distal DUO - dynamic ulna osteotomy

Ombrone, Maremmano M, 6 mo.
DUO only

Ombrone, Maremmano M, 2.5 yrs
FU 2 yrs.

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ED - early diagnosis & treatment

Distal DUO - dynamic ulna osteotomy

✓ Complications

- R & U synostosis
- Proximal ulna tilting
- No effect after 6-7 months of age
OCD - early diagnosis & treatment

Treatment strategies in 4-6 months old puppies:

‣ in case of clear early signs of starting OCD:
OCD - early diagnosis & treatment

Treatment strategies in 4-6 months old puppies:

- in case of clear early signs of starting OCD:
  
  1. distal DUO and joint treatment for wide lesions
  2. distal DUO only for mild lesions
  3. alternatively, conservative management and periodical rechecks
OCD - early diagnosis & treatment

Treatment strategies in 4-6 months old puppies:

- in case of clear early signs of starting OCD:
  1. distal DUO and joint treatment for wide lesions
  2. distal DUO only for mild lesions
  3. alternatively, conservative management and periodical rechecks

- in case of uncertain early signs of starting OCD:
OCD - early diagnosis & treatment

Treatment strategies in 4-6 months old puppies:

- in case of clear early signs of starting OCD:
  
  1. distal DUO and joint treatment for wide lesions
  2. distal DUO only for mild lesions
  3. alternatively, conservative management and periodical rechecks

- in case of uncertain early signs of starting OCD:
  
  1. repeat radiographic examination after 3 weeks
OCD - early diagnosis & treatment

Cloe, Dogue de Bordeaux, F, 4,5 mo., DUO only

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OCD - early diagnosis & treatment

Cloe, Dogue de Bordeaux, F, 11 mo., FU 6 mo.

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UAP - early diagnosis & treatment

Treatment strategies in 4-6 months old puppies:

- in case of clear early signs of UAP:
UAP - early diagnosis & treatment

Treatment strategies in 4-6 months old puppies:

- in case of clear early signs of UAP:
  1. proximal DUO and screw fixation of AP (stage 1 & 2)
UAP - early diagnosis & treatment

Treatment strategies in 4-6 months old puppies:

- in case of clear early signs of UAP:
  1. proximal DUO and screw fixation of AP (stage 1 & 2)
  2. proximal DUO and excision of AP (stage 3)
UAP - early diagnosis & treatment

Treatment strategies in 4-6 months old puppies:

- in case of clear early signs of UAP:
  1. proximal DUO and screw fixation of AP (stage 1 & 2)
  2. proximal DUO and excision of AP (stage 3)
  3. conservative management & periodical rechecks in asymptomatic dogs, with spontaneous resolution of joint incongruity
UAP - early diagnosis & treatment

Treatment strategies in 4-6 months old puppies:

- in case of clear early signs of UAP:
  1. proximal DUO and screw fixation of AP (stage 1 & 2)
  2. proximal DUO and excision of AP (stage 3)
  3. conservative management & periodical rechecks in asymptomatic dogs, with spontaneous resolution of joint incongruity

- in case of uncertain diagnosis of UAP:
UAP - early diagnosis & treatment

Treatment strategies in 4-6 months old puppies:

- in case of clear early signs of UAP:
  1. proximal DUO and screw fixation of AP (stage 1 & 2)
  2. proximal DUO and excision of AP (stage 3)
  3. conservative management & periodical rechecks in asymptomatic dogs, with spontaneous resolution of joint incongruity

- in case of uncertain diagnosis of UAP:
  1. repeat radiographic examination after 2 weeks (1 months in giant breeds)
UAP - early diagnosis & treatment

**Proximal DUO - dynamic ulna osteotomy**

- lengthening osteotomy, oblique proximo-distal
- triceps muscle pull
UAP - early diagnosis & treatment

Proximal DUO - dynamic ulna osteotomy
- lengthening osteotomy, oblique proximo-distal
- triceps muscle pull
UAP - early diagnosis & treatment

Proximal DUO - dynamic ulna osteotomy

- lag screw fixation of AP
- aiming device
UAP - early diagnosis & treatment

Proximal DUO - dynamic ulna osteotomy
• lag screw fixation of AP
• aiming device
UAP - early diagnosis & treatment

Proximal DUO - dynamic ulna osteotomy

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Proximal DUO - dynamic ulna osteotomy
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UAP - early diagnosis & treatment

Proximal DUO - dynamic ulna osteotomy
- lag screw fixation of AP
- aiming device
UAP - early diagnosis & treatment

Proximal DUO - dynamic ulna osteotomy
- lag screw fixation of AP

Duke, GSD, M, 5 mo.

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UAP - early diagnosis & treatment

Proximal DUO - dynamic ulna osteotomy

- lag screw fixation of AP

Duke, GSD, M, 5 mo.
UAP - early diagnosis & treatment

Proximal DUP - dynamic ulna osteotomy
- lag screw fixation of AP

Duke, GSD, M, 6 mo., FU 1 mo.
UAP - early diagnosis & treatment

Proximal DUO - dynamic ulna osteotomy

• lag screw fixation of AP

Duke, GSD, M, 2 yrs., FU 18 mo.
ED - early diagnosis & treatment

Proximal DUO - dynamic ulna osteotomy

✓ Complications

- persistent UAP
- implant failure
- ulnar non-union
- when surgery is too late
- over 6 mo. of age
ED - early diagnosis & treatment

Proximal DUO - dynamic ulna osteotomy

✓ Complications

- persistent UAP
- implant failure
- ulnar non-union
- when surgery is too late
- over 6 mo. of age
CONCLUSIONS

ED - early diagnosis & treatment
Elbow dysplasia causes a degenerative joint disease, progressive and irreversible.
Elbow dysplasia causes a degenerative joint disease, progressive and irreversible.

Diagnosis & Treatment should be precocious, before severe joint lesion are established.
Elbow dysplasia causes a degenerative joint disease, progressive and irreversible.

Diagnosis & Treatment should be precocious, before severe joint lesion are established.

Treatment of secondary joint lesions without addressing joint incongruity doesn’t avoid OA progression.
CONCLUSIONS

‣ Elbow dysplasia causes a degenerative joint disease, progressive and irreversible

‣ Diagnosis & Treatment should be precocious, before severe joint lesion are established

‣ Treatment of secondary joint lesions without addressing joint incongruity doesn’t avoid OA progression

‣ Early DUOs, freeing R&U, may allow a spontaneous improvement of joint congruity, both in short radius and in long radius syndromes
Thanks for the attention