Clinical Communication1

Intraoperative skeletal traction in the dog **L.** Rovesti
L. Rovesti

: 1veterinary.
Ngjarje a cuu

<mark>eric study</mark>
sti¹, **A. Margini¹, F. Cappellari², B. Peirone²
Clinic M. E. Miller. Cavriggo, Reggio Emilio, Italy** 2

²School of Veterinary Medicine of Turin, Grugliasco, Turin, Italy **averic siday
ovesti¹, A. Margini¹, F. Cappellari², B. Peirone²
lary Clinic M. E. Miller, Cavriago, Reggio Emilio, Italy
of Veterinary Medicine of Turin. Grualiasco. Turin. Italy** o, Italy

f_{max} point
ג

ry
skeletal traction technique was applied to mary
Indard skeletal traction technique was applied to
Indior seament of the appendicular skeleton of ten **nmary**
Indard skeletal traction technique was applied to
Indigor segment of the appendicular skeleton of
Joa cadavers. Opposition points and anchorage For the applied to
dard skeletal traction technique was applied to
najor segment of the appendicular skeleton of t
dog cadavers. Opposition points and anchorage
for the application of traction were determined a siunui
' in skeletal incritori lectrifique was appried
tips segment of the appendicular skeleton
g cadavers. Opposition points and anchoro
or the application of traction were determin
skeletal seament. Traction was exerted by each major segment of the appendicular skeleton of ten of a micrometric traction of the dependicular skeleton of ten
og cadavers. Opposition points and anchorage
for the application of traction were determined
the skeletal segment. Traction was exerted by
of a micrometric trac liesi
. by bandwers. Upposition points and anchorage
ts for the application of traction were determined
ach skeletal segment. Traction was exerted by
ns of a micrometric traction stand, connected to th
by bands or a stirrup. Tract points for the
Explored abolis application of itaction was exerted by
transmitter traction stand, connected
is or a stirrup. Traction was applied to
and the tibia through nylon traction for each skeletal segment. Traction was exerted by
means of a micrometric traction stand, connected to the an skeletar segment. Traction was exerted by
of a micrometric traction stand, connected to the
rachium and the tibia through nylon traction
anchored to the metacarpus and metatarsus. reilieuiis Of I
Itaal Lucha a incomenic ruction stand, connected to the
inds or a stirrup. Traction was applied to the
ium and the tibia through nylon traction
hored to the metacarpus and metatarsus, re-
A traction stirrup applied to the condylar reantebrachium and the tibia through nylon traction unius or a simple, machori was upplied to the
hium and the tibia through nylon traction
ichored to the metacarpus and metatarsus, re
y. A traction stirrup applied to the condylar re
used as the anchorage point to load the amebiachioni and the mold intologii hylon nachon
bands anchored to the metacarpus and metatarsus, r
spectively. A traction stirrup applied to the condylar r
gion was used as the anchorage point to load the hu
merus and fem bunus ancholed to the inelactipos and inelations, respectively. A traction stirrup applied to the condylar region was used as the anchorage point to load the humerus and femur. Once a peak force of 25 kg weight was achieve اد
.. echvery. A fraction simply applied to the concylatie-
on was used as the anchorage point to load the hu-
erus and femur. Once a peak force of 25 kg weight
as achieved, the load was monitored for half an hour
check for any gion was osea as me anchorage point to toua me in-
d femur. Once a peak force of 25 kg weight
ved, the load was monitored for half an hou
or any variation. After that, each skeletal seg
osteotomized in the mid-diaphyseal reaion. and ien
de la die die die die die van for one a peak force of 25 kg weight
the load was monitored for half an hou
in wariation. After that, each skeletal seg
otomized in the mid-diaphyseal region,
for any angular malalianment due to a mismatchbetween the bould was momified for the find the bone and the bone and the bone and the bone and the applied
between the axis of the bone and the applied lo check
.......... For any variation. After that, each skeletal set
is osteotomized in the mid-diaphyseal region,
luated for any angular malalignment due to c
th between the axis of the bone and the applit
Any ensuing angular malalignment wa ilieili wu
I corrected by angular manufactures using under
the technometric process to the traction
of the technometric state the traction
Any ensuing angular malalignment was su
corrected by manoeuvres using the traction and evaluated for any angular malalignment due to a
mismatch between the axis of the bone and the applied Fractional or driv angular indidigmment over to the between the axis of the bone and the applig.
The technique angular malaligmment was suc-
Ily corrected by manoeuvres using the traction
The technique used in this study t loading. Any ensuing angular malalianment was sucerveen me axis of me bone and me applie
y ensuing angular malalignment was suc-
rected by manoeuvres using the traction
echnique used in this study to perform in-
skeletal traction proved to be reliable and rouding. Any ensuing angular malangmment was successfully corrected by manoeuvres using the traction
stand. The technique used in this study to perform in-
traoperative skeletal traction proved to be reliable and
consisten eton.traoperative skeletal traction proved to be reliable and consistent for each segment of the appendicular skel-
eton.

Kevwords

Dog, fracture reduction, skeletal traction

Vet Comp Orthop Traumatol 2006; 19: ■–■

Introduction

Introduction
The need for techniques for fracture reduc**is often felt** in veterinary orthopaedics miques for fracture reduc-

n veterinary orthopaedics

(1, 2). Nevertheless, the The need for techniques for fracture reduction is often felt in veterinary orthopaedics
and traumatology (1, 2). Nevertheless, the
development of such techniques has not and trauma development of such techniques has not tology (1, 2). Nevertheless, the
nt of such techniques has not
intense, particularly when com-
developments in human orthodevelopment of such techniques has not
been very intense, particularly when com-
pared with developments in human ortho-
paedics. Skeletal traction has been applied been very intense, particularly when com-
pared with developments in human ortho-
paedics. Skeletal traction has been applied
in a consistent way in humans for almost all pared with developments in human ortho-
paedics. Skeletal traction has been applied
in a consistent way in humans for almost all
types of fractures through the use of stanin a consistent way in humans for almost all Skeletal traction has been applied
istent way in humans for almost all
fractures through the use of stan-
reduction techniques. fracture in a consistent way in humans for almost all
types of fractures through the use of stan-
dardized reduction techniques, fracture
tables and specific instruments that are detypes of f ractures through the use of stan-
reduction techniques, fracture
specific instruments that are de-
various patient positions. The use uu
... skeletal traction in texture
skeletal traction in humans is standard
skeletal traction in humans is standard tables and specific instruments that are de-
signed for various patient positions. The use
of skeletal traction in humans is standard
procedure for both preoperative and in-Signed for various patient positions. The use
of skeletal traction in humans is standard
procedure for both preoperative and in-
traoperative fracture reduction. The aim of
our work was to evaluate the technical feasiprovides a particular positions. The use
traction in humans is standard
for both preoperative and in-
fracture reduction. The aim of procedure for both preoperative and in-
traoperative fracture reduction. The aim of
our work was to evaluate the technical feasi-
bility of a method of application of intraoptraoperative fracture reduction. The aim of the technical feasi-
blication of intraop-
to each of the apper our work was to evaluate the technical feasi-
bility of a method of application of intraoptor
op-
rebility of a method of application of intraoperative skeletal traction to each of the appendicular skeletal segments for fracture reduction in dogs, similar to that employed in pendicular skeleta
duction in doos si duction in dogs, similar to that employed in
human orthopaedics. pendicular skeletal segments fo
duction in dogs, similar to that
human orthopaedics.
Material and methods

nd methods
performed on ten fresh ca-<u>marc</u>

Fial and methods
udy was performed on ten fresh ca-
of dogs that had died for reasons un-The study was performed on ten fresh ca-
davers of dogs that had died for reasons un-
related to the investigation. The dogs rhe stady was performed on ly was performed on ten fresh ca-
f dogs that had died for reasons un-
to the investigation. The dogs
between 25 and 35 kg. A total of 80 related to the investigation. The dogs weighed between 25 and 35 kg. A total of 80 humerus, the investigation. The dogs
ighed between 25 and 35 kg. A total of 80
bendicular skeletal segments (20 each for
humerus, radius and ulna, femur, and weighed between 25 and 35 kg. A total of 80
appendicular skeletal segments (20 each for
the humerus, radius and ulna, femur, and
tibia) were evaluated. The procedures were the humerus, radius and ulna, femur, and lar skeletal segments (20 each for
us, radius and ulna, femur, and
evaluated. The procedures were
using a surgical table (Ergomed the humerus, radius and ulna, femur, and
tibia) were evaluated. The procedures were
performed using a surgical table (Ergomed
99. Med Matrix, Modena, Italy) which had performed using a surgical table (Ergomed were evaluated. The procedures were
ned using a surgical table (Ergomed
d Matrix, Modena, Italy) which had
attachments and instruments to faperformed using a surgical table (Ergomed
99, Med Matrix, Modena, Italy) which had
special attachments and instruments to fa-
cilitate traction. For each skeletal segment. 99, Med Matrix, Modena, Italy) which had
special attachments and instruments to fa-
cilitate traction. For each skeletal segment,
the dog's body position on the surgical table. special at
cilitate tra the dog's body position on the surgical table, the opposition points, and the anchorage
points for force application were identified. the opposition points, and the anchorage
points for force application were identified.
Wet Comp Orthop Traumatol 1/2006

 opposition points were defined as the on points were defined as the body where stabilization could The opposition points were defined as the points on the body where stabilization could
be applied to counteract the traction forces
and avoid translation, without injuring the points on the body where stabilization could
be applied to counteract the traction forces
and avoid translation, without injuring the
patient. Anchorage points were defined as $\frac{1}{100}$ and avoid transmitted. applied to counteract the traction forces
a avoid translation, without injuring the
ient. Anchorage points were defined as
points where traction could be applied fractured skeletal segment.
Fractured skeletal segment. the points where traction could be applied the bone of the bone or the soft tis-
the fractured skeletal segment,
damaging the bone or the soft tisthe points where traction could be applied
distal to the fractured skeletal segment,
without damaging the bone or the soft tis-
sues. The following instruments were used without damaging the bone or the soft tiswithout damaging the bone or the soft tis-
sues. The following instruments were used
in this study:
A surgical table with lateral rails to ϵ s. The foll

- coming instruments were used
also to clamps for holding instruthis study:
A surgical table with lateral rails to
which the clamps for holding instru-
ments were connected, and a ·micrometwhich the clamps for hol surgical table with lateral rails to
ich the clamps for holding instru-
ints were connected, and a micromet-
traction stand which could be lengments were connected, and a micromet-

increase that the ment of the leng-

thened by up to 20 cm (Fig. 1);

Autoclavable nylon bands with a loop on thened by up to 20 cm (Fig. 1); traction stand which could be leng-
hed by up to 20 cm (Fig. 1);
oclavable nylon bands with a loop on
end that were placed on the distal an-
- thened by up to 20 cm (Fig. 1);
Autoclavable nylon bands with a loop on
one end that were placed on the distal an-
chorage points for the application of tracone end that were placed on the distal anoclavable nylon bands with a loop on
end that were placed on the distal an-
rage points for the application of trac-
to the antebrachium and the tibia chorage points for the application of traction to the antebrachium and the tibia chorage points for the application of traction to the antebrachium and the tibia
(Fig. 2);
Nylon anchorage bands of various $(Fig. 2)$: the antebrachium and the tibia
;
anchorage bands of various
that were applied to the opposi-
- Nylon anchorage bands of various
lengths that were applied to the opposi-
tion points to hold the patient on the table ryfon
lengths
tion poir
(Fig. 2). lengths that were applied to the opposition points to hold the patient on the table
(Fig. 2).

• Aluminium hooks on the lateral rail of $(fig. 2).$ the patient on the table
the g. 2).
Iminium hooks on the lateral rail of
table for anchorage of the nylon
- Aluminium hooks on the lateral rail of
the table for anchorage of the nylon
bands (Fig. 3);
Stainless steel stabilizers were employed bands (Fig. 3); e table for anchorage of the nylon
nds (Fig. 3);
ainless steel stabilizers were employed
hold the dog in certain positions on the α
- (Fig. 3);
less steel stabilizers were employed
d the dog in certain positions on the
and to also reduce pressure exerted Stainless steel stabilizers were employed
to hold the dog in certain positions on the
table, and to also reduce pressure exerted
by the nylon bands on the dog's body de not the tog in ect dan positions on the
table, and to also reduce pressure exerted
by the nylon bands on the dog's body
(Fig. 3);
An autoclavable, stainless steel traction by the nylon bands on the dog's body $(Fig. 3)$:
- European of the dogs sody.

13);

autoclavable, stainless steel traction

up was used for application of trac-

to both distal and proximal skeletal • An autoclavable, stainless steel traction $\sum_{i=1}^{n}$ stirrup was used f
tion to both distal
segments (Fig. 4): stirrup was used for application of traction to both distal and proximal skeletal
segments (Fig. 4);
Limb rests connected to the lateral rails on to both distal and proximal skeletal
gments (Fig. 4);
mb rests connected to the lateral rails
the table were also used at certain oppoginum
Limb
- of the table were also used at certain op-
position points (Fig. 5).

Rovesti et al.

$Fig. 3$

 view of the same $\frac{1}{2}$ the same the same
in Fig. 2.
each band **nyabead**
Davod view af-the cam positioning as in Fig. 2. hooks (F), which
adjusted by at-
them to the alu-
hooks (F), which The tension of each band ur bund
by at-
le alu-
l, which
lateral may be adiusted by atril dy na ni
tach in a th em to the alu
ooks (F), whi
long the later
table. Notice the discreption of the discreption
trail of the table. Notice
the use of a stabilizer (G) can run along the lateral rail of the table. Notice
trail of the table. Notice
the use of a stabilizer (G)
for the dog's back. The
nylon band over the neck
that is used for patient
stabilization, passes over
the stabilizer, to avoid rail of the table. Notice the use of a stabilizer (G) ine use of a stabilizer (O)
for the dog's back. The rryton band over the ne
that is used for patient marrs used for partem
stabilization, passes over the stabilizer, to avoid
compression of the base of the neck.

Fig. 2 Positioning for traction of the forelimb, with
cranio-medial approach to the radius-ulna. The limb is sub-
iected to traction by traction bands (D), and the doa's body jected to traction by traction bands (D) , and the dog's body
is held in position by nylon bands (E) . (e).
11
(E).
(E).

segment traction by nylon bands (E). \mathbf{A}

Crantide School
Cranelistic in Lateral

traction was positioned with
the humerus at the border
Vet Comp Orthop Traumatol 1/2006 **approach:** The dogs were **roach**: The dogs were recumbency with the **Cranio-medial approach**: The dogs were positioned in lateral recumbency with the affected limb down and the contralateral bgs were
with the
tralateral
thoracic positioned in lateral recumbency with the affected limb down and the contralateral
forelimb maintained against the thoracic
wall with the shoulder flexed. The neck was affected limb forelimb maintained against the thoracic wall with the shoulder flexed. The neck was be maintained against the thoracic
th the shoulder flexed. The neck was
d. The limb that was to be subject to
was positioned with the midshaft of wan what the shoulder reader. The heek was
extended. The limb that was to be subject to
traction was positioned with the midshaft of
the humerus at the border of the table. The

Fig. 4

ntion
traction ig. 4
ositioning for traction
le humerus. The traction
exerted via a traction **LIY: 7**
Decitioning for traction of the humerus. The traction erus. The traction
d via a traction
H) applied to the
condvle, so as to is exerted via a traction a traction
blied to the
rle, so as to
to the disthe started via a matrici
stirrup (H) applied to t
humeral condyle, so as
avoid damage to the d
tal structures, since the humeral condyle, so as to rel condyle, so as to
ral condyle, so as to
damage to the dis-
uctures, since the
required for reducavoid damage to the disthe distribution
damage to the districtures, since the
required for redu
this segment are tal structures, since the le ro m
, since
ed for
large.

$Fig. 5$

provided by a mind resi
/i\ $\left(\mathsf{I}\right)$. α tion of α bilat-
the tibia. **The Section of Section**
The hindlimb for a bila
The opposition point is
The opposition point is the hindlimb for a bilateral approach to the tibia.

forelimb, with the short com-
forelimb, with the short comn stand was attached to the table cau-
the forelimb, with the short com-
oriented cranially, so that traction traction stand was attached to the table caudal to the forelimb, with the short component oriented cranially, so that traction could be exerted with the cranio-medial re-

f the antebrachium required (Fig. 2). **Comparison 1 and 1 and 1 and 1 and 1 and 1 approach:** The forelimb Cranio-lateral approach: The forelimb gion of the antebra

pletely unobstructed (Fig. 2).
 Cranio-lateral approach: The forelimb

subject to traction was placed uppermost

dog positioned in lateral recumbene dog positioned in lateral recumben-
contralateral forelimb was flexed at with the dog positioned in lateral recumben-
cy. The contralateral forelimb was flexed at
the elbow and secured with the carpus under with the dog positioned in lateral recumben-
cy. The contralateral forelimb was flexed at
the elbow and secured with the carpus under
the dog's muzzle. In all other respects, the the elbow and secured with the carpus under tralateral forelimb was flexed at
nd secured with the carpus under
uzzle. In all other respects, the
of the dog and traction stand $\frac{u}{4}$ the same as examed with the carpus under log's muzzle. In all other respects, the ioning of the dog and traction stand the same as for the cranio-medial anthe dog's mazzle. In an our
positioning of the dog and
were the same as for the cra
proach to the antebrachium. Example of the dog and traction stand
the same as for the cranio-medial ap-
ach to the antebrachium.
Opposition points: Two bands were were the
proach to Exercise as for the cranio-medial aption the antebrachium.
 Solution points: Two bands were over the sternum. A dorsal stabilizer

i the antebrachium.
 sition points: Two bands were

ver the sternum. A dorsal stabilizer

on the dorsal area of the neck. The band crossed over the sternum. A dorsal stabilizer
was used on the dorsal area of the neck. The
band crossing the upperside surface of the necessed over the sternam.⁷
was used on the dorsal area band crossing the upperside surface of the pressure of the
pressure on the
pressure on the band clossing the upperside surface of the
neck region was passed over the stabilizer
(Fig. 3) so that excessive pressure on the
base of the neck by this band could be (Fig. 3) so that excessive pressure on the **g. 3**) so that excessive pressure on the
ise of the neck by this band could be
ided.
Anchorage points: For this traction $\frac{1}{2}$ avoided.

rage points: For this traction
bands applied to the carpo-meta-Anchorage points: For this traction
technique, bands applied to the carpo-meta-
carpal region of the forelimb were usually **rage points:** For this traction
bands applied to the carpo-meta-
ion of the forelimb were usually
bands were coupled in order to evenlydd, region of the forelimb were usually
The bands were coupled in order to
distribute the traction forces to both
f the limb. Although not tested in this used. The bands were coupled in order to forces to both
t tested in this
could also be evenly distribute the traction forces to both
sides of the limb. Although not tested in this
study, a transosseous K-wire could also be
inserted through the distal epiphyseal region sides of \ln
study, a ti the film although not tested in this
the radius, a transosseous K-wire could also be
serted through the distal epiphyseal region
the radius, or through the metacarpal ansosseous K-wire could also be
prough the distal epiphyseal region
dius, or through the metacarpal
anchorage in case of older, disof the radius, or through the metacarpal or over-riding fractures.
The or anchorage in case of or over-riding fractures. ur uw n
hones fo

Humerus

 in lateral recum-Humerus
The dogs were positioned in lateral recum-
bency with the affected limb uppermost,
similar to that used for the cranio-lateral apbency with the affected limb uppermost, gs were positioned in lateral recumvith the affected limb uppermost,
to that used for the cranio-lateral ap-
to the antebrachium (Fig. 4). The bency with the affected limb uppermost,
similar to that used for the cranio-lateral ap-
proach to the antebrachium (Fig. 4). The
traction stand was placed caudal to the foreproach to the antebrachium (Fig. 4). The ar to that used for the cranio-lateral ap-
ch to the antebrachium (Fig. 4). The
ion stand was placed caudal to the fore-
with the short component oriented proach to the antebrachium (Fig. 4). The
traction stand was placed caudal to the fore-
limb with the short component oriented
caudally, in order to exert axial traction on traction stand was pla
limb with the short
caudally, in order to
the humerus (Fig. 4). **b** with the short component oriented idally, in order to exert axial traction on humerus (Fig. 4).
Opposition points: A single band was vauuan
11. s. 1. s. s

Opposition points: A single band was inthe humerus (Fig. 4).
 Opposition points: A single band was

ssed circumferentially around the thorax

the region caudal to the axilla for surgical **Opposition points:** A single band was
passed circumferentially around the thorax
in the region caudal to the axilla for surgical
approaches of the entire humerus (Fig. 4). passed circumferentia ally around the thorax
of the axilla for surgical
tire humerus (Fig. 4).
of the distal portion of in the region caudal to the axilla for surgical
approaches of the entire humerus (Fig. 4).
For surgical exposure of the distal portion of
the humerus alone, two bands crossing over approach
For surgi roaches of the entire humerus (Fig. 4).
surgical exposure of the distal portion of
humerus alone, two bands crossing over
sternum were used. A dorsal stabilizer cal exposure of the distal portion of
rus alone, two bands crossing over
um were used. A dorsal stabilizer
dorsal to the neck when two bands the humerus alone, two bands crossing over
the sternum were used. A dorsal stabilizer
was used dorsal to the neck when two bands
are used. The band crossing the upper sur- $\frac{1}{2}$ was used dors sternum were used. A dorsal stabilizer
used dorsal to the neck when two bands
used. The band crossing the upper sur-
of neck was placed over the dorsal staal to the neck when two bands
the about the upper sur-
was placed over the dorsal sta-
application to the radius and $\frac{u_1 v_1}{c_1}$ ulna. **A** e of neck was placed over the dorsal sta-
izer as for application to the radius and
a.
Anchorage points: For this traction $\frac{1}{2}$ technique for application to the radius and
 rage points: For this traction

the traction stirrup was used in

ulna.
Anchorage points: For this traction
technique, the traction stirrup was used in
conjunction with a transosseous K-wire technique, the traction stirrup was used in to the condylar region of the traction
tion with a transosseous K-wire
the condylar region of the humerus. technique, the traction stirrup was used in
conjunction with a transosseous K-wire
through the condylar region of the humerus,
in a position that was compatible with the

6 The community of the time of the findlimb for the cranio-medial approach
the hindlimb for the
to the tibia. The limb is rosmoning for riden
the hindlimb for the Fia. 6 to machon
traction
The limb is
traction by tractionalist of the most of reduct approach
to the tibia. The limb is
subjected to traction by
traction bands, and the to the tibia. The limb is
subjected to traction by
traction bands, and the
dog's body is held in posisubiected to traction by

tion by nylon bands.

exerted by the secret of \mathcal{L}

of the femur. **. 7**
itioning for traction o
femur. The traction is ry.
Positioning for traction of
the femur. The traction is
exerted by a traction stir-
rup applied to the femoral the femur. The traction is Ing for fruction t
In The fraction is
by a fraction stir
lied to the femol
The foot is kept exerted by a traction stirt
T-
To
To m andiad to the formers maintain axial alianment rop uppneu
condyle. The
elevated by c
maintain axi
of the femur.

of fracture and the proposed osteosynf fracture and the proposed osteosyntechnique (Fig. 4). The wire ends site of fracture and the proposed osteosyn-
thesis technique (Fig. 4). The wire ends
were connected to the stirrup arms by means site of fracture and the proposed osteosyn-
thesis technique (Fig. 4). The wire ends
were connected to the stirrup arms by means
of bolts. Once secured, the wire was ten t hesis techni que (Fig. 4). The wire ends
ed to the stirrup arms by means
se secured, the wire was ten-
stirrup lever mechanism. This were connected to the stirrup arms by means
of bolts. Once secured, the wire was ten-
sioned by the stirrup lever mechanism. This
tensioning avoided wire bending, and presioned by the stirrup lever mechanism. This s. Once secured, the wire was ten-
by the stirrup lever mechanism. This
ing avoided wire bending, and pre-
soft tissues from being cut by the bent wire. The start wire bending, and pre-

tensioning avoided wire bending, and pre-

vented soft tissues from being cut by the

bent wire.

In preliminary testing we found that tracvented soft tissues from being cut by the tion wire.

In preliminary testing we found that tracesting we found that trac-
le bands applied to carpo-
could damage the distal In preliminary testing we found that traction exerted with the bands applied to carpometacarpal region could damage the distal structures, before exerting any useful tracto carported with the banks approach o carported to carporte

metacarpal region could damage the distal

structures, before exerting any useful trac-

tion on the humerus, because the musculastructures, before exerting any useful traction on the humerus, because the musculaon the l
surrous
strong. tion
ture

Tibia

approach: The dogs were **roach**: The dogs were recumbency with the $\overline{C_{\text{max}}}$ positioned in lateral recumbency with the
affected limb down, and the contralateral

the stifle hindlimb secured caudally with the stifle
flexed and the hip extended (Fig. 6). The
limb that was being subjected to traction flexed and the hip extended (Fig. 6). The limb that was be that was being subjected to traction
bositioned with the midpoint of the fe-
diaphysis overlying the border of the
The traction stand was positioned cauwas posit moral diaphysis overlying the border of the table. The traction stand was positioned cauoral diaphysis overlying the border of the
ble. The traction stand was positioned cau-
1 to the limb, with the shorter component
the stand oriented cranially, in order to $\frac{1}{1}$ $\frac{1}{1}$ The traction stand was positioned cau-
the limb, with the shorter component
e stand oriented cranially, in order to
the cranio-medial aspect of the tibia dative the stand oriented cranially, in order to
f the stand oriented cranially, in order to
keep the cranio-medial aspect of the tibia
completely unobstructed (Fig. 6).
Combined medial and lateral ap**proachering**
properties: The dogs were positioned in dor-
proaches: The dogs were positioned in dorcompletely unobstructed (Fig. 6).

tion stand was connected to the end of the table, slightly medial or slightly lateral to
Vet Comp Orthop Traumatol 1/2006 mpletely unobstructed (Fig. 6).
Combined medial and lateral ap-
paches: The dogs were positioned in dor-
recumbency. The limb being subject to **Combined medial and lateral approaches:** The dogs were positioned in dorsal recumbency. The limb being subject to traction was extended caudally, with a sup $proaches:$ in the uses were positioned in dor-
incy. The limb being subject to
sextended caudally, with a sup-
in the popliteal region (Fig.5). sal recumbency. The limb being subject to
traction was extended caudally, with a sup-
port placed in the popliteal region (Fig.5).
The contralateral hindlimb was positioned incured was extended
port placed in the action was extended caudally, with a sup-
ort placed in the popliteal region (Fig.5).
he contralateral hindlimb was positioned
abduction with the ioints flexed and sepopliteal region (Fig.5).
hindlimb was positioned
the joints flexed and se-
calcaneus was as close as The contralate in abduction with the joints flexed and secured such that the calcaneus was as close as bduction with the joints flexed and se-
d such that the calcaneus was as close as
ible to the ischiatic tuberosity. The trac-
stand was connected to the end of the cured such that the calcaneus was as close as
possible to the ischiatic tuberosity. The trac-
tion stand was connected to the end of the
table, slightly medial or slightly lateral to

 limb, depending upon the proposed pro- (Fig. 5). Usually, two lateral stabithe limb, depending upon the proposed pro-
cedure (Fig. 5). Usually, two lateral stabi-
lizers were applied in the thoracic region to cedure (Fig. 5). Usually, two lateral stabidepending upon the proposed
Fig. 5). Usually, two lateral
re applied in the thoracic regi
this position during traction. Fig. 5). Usually, two lateral stabi-

pers were applied in the thoracic region to

intain this position during traction.
 Opposition points: For the cranio-medi- \mathbf{u} rest were applied in the thoracic region to
aintain this position during traction.
Opposition points: For the cranio-medi-
approach to the tibia, two nylon bands $\overline{\Omega}$

tain this position during traction.
pposition points: For the cranio-medi-
proach to the tibia, two nylon bands
applied. One band was passed over the Opposition po **bounding**: For the cranio-medi-
tibia, two nylon bands
the band was passed over the
across the inguinal region al approach to to the tibia, two nylon bands
One band was passed over the
m, across the inguinal region
scrotum of male dogs, and were applied. One band was passed over the
uppermost ilium, across the inguinal region
and under the scrotum of male dogs, and
then secured to the table caudo-dorsally. The uppermost ilium, parties are in giantification
protum of male dogs, and
the caudo-dorsally. The
passed circumferentially $\frac{d}{dx}$ then secure and under the scrotum of male dogs, and
then secured to the table caudo-dorsally. The
second band was passed circumferentially red to the table caudo-dorsally. The
band was passed circumferentially
he caudal region of the abdomen
ends were secured to the table dorsally.
For the combined medial and lateral ap-
For the combined medial and lateral apand both ends were secured to the table dors-
ally.
For the combined medial and lateral ap-
proaches to the tibia, the oppositional forces ally.
For the combined medial and lateral an-

or the combined medial and lateral applied to the thigh part of the thigh For the combined medial and lateral approaches to the tibia, the oppositional forces
were applied to the caudal part of the thigh
by means of a limb rest placed in the popliwere applied to the caudal part of the thigh region. Although the tibia, the oppositional forces
be applied to the caudal part of the thigh
means of a limb rest placed in the popli-
region. Although not evaluated in the were applied to the caudal part of the thigh
by means of a limb rest placed in the popli-
teal region. Although not evaluated in the
present study, padding could be applied to by means of a limb rest placed in the popli-
teal region. Although not evaluated in the
present study, padding could be applied to
the limb rest and the traction force tempor- real region. present study, padding could be applied to present study, padding could be applied to
the limb rest and the traction force tempor-
arily relaxed every 15–20 minutes if a long-
lasting traction was foreseen in a clinical arily relaxed every 15–20 minutes in
antipa_{ring} traction was forecast in a r_{num} ny relaxed every 15 26 initials it a long
lasting traction was foreseen in a clinical
setting.
Anchorage points: Coupled nylon

chorage points: Coupled nylon
were applied to the tarso-metatarsal
of the limb for traction in order to Anchorage points: Coupled nylon Anchorage Points. Coupled hylon
bands were applied to the tarso-metatarsal
region of the limb for traction in order to
evenly distribute the forces along the longi-For the timbia. As for the disomination
tion of the limbia. As for the humerus,
traction stirrup could potentially be antheorem
theorem to all problems ribute the forces along the longi-
s of the tibia. As for the humerus,
a stirrup could potentially be an-
transosseous K-wire in the distal tudinal axis of the tibia. As for the humerus,
the traction stirrup could potentially be an-
chored to a transosseous K-wire in the distal
epiphysis of the tibia, or the metatarsal the traction stir represents K-wire in the distal
sosseous K-wire in the distal
ne tibia, or the metatarsal
of distal. over-riding frac- $\frac{1}{2}$ bones in cases of distal, over-riding fractures.

Femur

 in lateral recumthe limb being subjected to trac-
the limb being subjected to trac- $T_{\rm{th}}$ dogs were positioned in lateral recum-
by with the limb being subjected to trac-
unnermost. The contralateral limb was The dogs were positioned in lateral recum-
bency with the limb being subjected to trac-
tion uppermost. The contralateral limb was
secured to the table caudally with the stifle bency with the limb being subjected to trac-
most. The contralateral limb was
the table caudally with the stifle
the calcaneus positioned close to tion uppermost. The contralateral limb was
secured to the table caudally with the stifle
flexed and the calcaneus positioned close to
the ischial tuberosity. The traction stand was flexed and the calcaneus positioned close to to the table caudally with the stifle
and the calcaneus positioned close to
al tuberosity. The traction stand was
to the table cranial to the limb, with flexed and the calcaneus positioned close to
the ischial tuberosity. The traction stand was
attached to the table cranial to the limb, with
the shorter portion oriented caudally so that the issued to the tal is chial tuberosity. The traction stand was
the could be examiled to the limb, with
shorter portion oriented caudally so that
traction could be exerted along the be cranial to the limb, with
n oriented caudally so that
ld be exerted along the
of the femur. A limb rest the shorter portion oriented caudally so that
the traction could be exerted along the the support of could be exerted along the tarsus, in order to support the tarsus, in order to maintainFig. 2.1 ion could be exerted along the real axis of the femur. A limb rest l to support the tarsus, in order to the limb in a horizontal plane (Fig. \overline{a} **Same Startup Startup** maintain the limb in a horizontal plane (Fig.
7).
Opposition points: A band was passed
across the abdomen caudally, just under the 7).
Opposition points: A band was passed

ilial wing, and then across
gion, and under the scroture
Vet Comp Orthop Traumatol 1/2006 **Opposition points:** A band was passed was the abdomen caudally, just under the wing, and then across the inguinal re- $\frac{9}{2}$ **pposition points:** A band was passed
s the abdomen caudally, just under the
wing, and then across the inguinal re-
and under the scrotum of male dogs.

secured caudo-dorsally to the and was secured caudo-dorsally to the A second band was passed around the caudal regional regi
Tradicional regional regional
 secured caudo-dorsally to the
d band was passed around the
of the abdomen and both ends table. A second band was passed around the the band was secured caudo-dorsally to the
ble. A second band was passed around the
udal region of the abdomen and both ends
this band were secured to the table dorsable. A second data was passed about the
caudal region of the abdomen and both ends
of this band were secured to the table dors-
ally.
Anchorage points: For this traction of this band were secured to the table dors-
ally. the traction stirrup and were secured to the traction
the traction stirrup anchored to a

 $\frac{any.}{\text{Archorag}}$ technique the traction stirrup anchored to a **rage points**: For this traction
the traction stirrup anchored to a
lar K-wire placed in the distal
femur was used because of the technique the traction stirrup anchored to a
transcondylar K-wire placed in the distal
end of the femur was used because of the
strength of the thigh muscles and also beend of the femur was used because of the it was used in the distal
f the femur was used because of the
the of the thigh muscles and also be-
it was believed that traction exerted strength of the t cause it was believed that traction exerted high muscles and
ieved that tractic
rcling the tarso-n
distal structures. cause it was believed that
with bands encircling the traction
tarso-met
ctures.
traction

A dynamometerskeletal traction
(Yo-Zuri America, Lucie, Applicati

ion of skeletal traction
Someter (Yo-Zuri America, Lucie,
was secured to the short portion λ \pm Francois of Skotchar Hathon

1 America, Lucie,

SA) was secured to the short portion

traction stand. Nylon bands secured to A dynamometer (Yo-Zuri America, Lucie, FL, USA) was secured to the short portion
of the traction stand. Nylon bands secured to
the metacarpal or metatarsal regions (Fig. FL, USA) was secured to the short portion
of the traction stand. Nylon bands secured to
the metacarpal or metatarsal regions (Fig.
2), or a small chain connected to the traction of the traction the metacarpal or metatarsal regions (Fig. die meteraties
2), or a small χ For the measure regions $(1.1g)$.

hain connected to the traction

), was then connected to the

Each skeletal segment was

1 to traction by turning the dynamometer. Each skeletal segment was (Fig. 4), was then connected to the
ometer. Each skeletal segment was
ubjected to traction by turning the
of the traction stand, making it lengthen subjected to the mometer. Each skeletal segment was
subjected to traction by turning the
le of the traction stand, making it leng-
The applied force was measured using action by turning the
istand, making it leng-
ce was measured using
was incrementally inhandle of the traction stand, making it leng-
then. The applied force was measured using
a dynamometer, and was incrementally in-
creased at a rate of 5 kg weight every two a dynamometer, and was incrementally increased at a rate of 5 kg weight every two
minutes, applying more traction as needed
to maintain the scheduled force. Once a e applied force was measured using
ometer, and was incrementally in-
at a rate of 5 kg weight every two
applying more traction as needed creased at a rate of 5 kg weight every two minutes, applying more traction as needed force at a rate of 5 kg weight every two
tes, applying more traction as needed
aintain the scheduled force. Once a
force of 25 kg weight was attained. to maintain the scheduled force. Once a applying more traction as needed
tain the scheduled force. Once a
rce of 25 kg weight was attained,
was then maintained at this magnito manual the seneddied fore relation the scheduled force. Once a
force of 25 kg weight was attained,
ion was then maintained at this magni-
for half an hour. Each skeletal segment is attained,
his magni-
al segment
a mid-diatraction was then maintained at this magnitude for half an hour. Each skeletal segment
was then surgically exposed, and a mid-dia-
physeal osteotomy was created using an oswas then surgically exposed, and a mid-diahalf an hour. Each skeletal segment
i surgically exposed, and a mid-dia-
osteotomy was created using an os-
saw. The radius and ulna were ex- $_{\text{shear}}$ en surgically exposed, and a mid-dia-
al osteotomy was created using an os-
ng saw. The radius and ulna were ex-
and osteotomized via a medial apphyseal osteotomy was created using an os-
cillating saw. The radius and ulna were ex-
posed and osteotomized via a medial ap-
proach to the radial diaphysis. If difficulties posed and osteotomized via a medial aping saw. The radius and ulna were ex-
d and osteotomized via a medial ap-
ch to the radial diaphysis. If difficulties
encountered with making the ulnar osposed and osteotomized via a medial approach to the radial diaphysis. If difficulties
were encountered with making the ulnar os-
teotomy with the oscillating saw, then an osproach to the
were encount o the radial diaphysis. If difficulties
countered with making the ulnar os-
with the oscillating saw, then an os-
was used to complete the cut. The ered with making the ulnar os-
the oscillating saw, then an os-
used to complete the cut. The
exposed by a cranio-lateral anteotomy with the oscillating saw, then an os-
teotome was used to complete the cut. The
humerus was exposed by a cranio-lateral ap-
proach, the femur by a lateral approach and teotome was used to complete the cut. The
humerus was exposed by a cranio-lateral aptome was used to complete the cut. The
merus was exposed by a cranio-lateral ap-
ach, the femur by a lateral approach and
tibia by a medial approach. In some inproach, the femur by a lateral approach and is was exposed by a cranio-lateral ap-
the femur by a lateral approach and
a by a medial approach. In some in-
it was also necessary to use the osproach, the femur by a lateral approach and
the tibia by a medial approach. In some in-
stances it was also necessary to use the os-
teotome to complete the fibular osteotomy. the tibia by a medial approach. In some in-
stances it was also necessary to use the os-
teotome to complete the fibular osteotomy.
All displacement of the bone segments, due stances it was also necessary to disc the est
teotome to complete the fibular osteotomy.
All displacement of the bone segments, due
to the mismatch between the bone axis and
the direction of the traction, was then cor-All displacement of the bone segments, due All displacement of the bone segments, due
to the mismatch between the bone axis and
the direction of the traction, was then cor-
rected by manoeuvres with the traction to the mismatch between the bone axis and
the direction of the traction, was then cor-
rected by manoeuvres with the traction
stand until realignment of the skeletal segrected by manoeuvres with the traction rection of the traction, was then cor-
by manoeuvres with the traction
until realignment of the skeletal seg-
was achieved. These manoeuvres stand until real
ments was ac
were recorded.

Results

EXULTS
the commencement of application of the commencement of application of traction, it was found necessary to reading the main term in the control of th nmencement of application of
tion, it was found necessary to
traction stand repeatedly so that At the commencement of application of
skeletal traction, it was found necessary to
readjust the traction stand repeatedly so that
the incremental increases in force could be skeletal traction, it was found necessary to
readjust the traction stand repeatedly so that
the incremental increases in force could be
maintained. However, as higher forces were readjust the traction stand repeatedly so that
the incremental increases in force could be
maintained. However, as higher forces were
applied, readjustment was seldom necessthe incremental increases in force could be
maintained. However, as higher forces were incremental increases in force could be
ntained. However, as higher forces were
lied, readjustment was seldom necess-
Once the peak force of 25 kg weight was achieved,ed. However, as higher forces were
readjustment was seldom necess-
the peak force of 25 kg weight was
the loss of load in the following applied, readjustment was seldom necessary. Once the peak force of 25 kg weight was
achieved, the loss of load in the following
half an hour was always very low, and never ary. Once the peak force of of 25 kg weight was
d in the following
very low, and never
After the skeletal achieved, the loss of load in the following
half an hour was always very low, and never
more than 3 kg weight. After the skeletal
segment in traction was osteotomized. than an hour was always very low, and hever
more than 3 kg weight. After the skeletal
segment in traction was osteotomized,
translation of the bone fragments by at least
100% of the bone diameter was observed in 1101c u
segmer t in traction was osteotomized,
ion of the bone fragments by at least
of the bone diameter was observed in
12 humeri, 7 tibiae, and 14 femora. translation of the bone fragments by at least
100% of the bone diameter was observed in
5 radii, 12 humeri, 7 tibiae, and 14 femora.
Each of these skeletal segments were suc- 100% of the bone diameter w as observed in
and 14 femora.
ents were suc-
alignment by $\frac{1}{2}$ mand, $\frac{1}{2}$ mand e skeletal segments v
ored to normal align
of the traction stand. The of these skeletal segments were suc-
sfully restored to normal alignment by
noeuvring of the traction stand.
Correction of varus or valgus malalign- $\frac{1}{2}$

Correction of varus or valgus malaligntitui
/ oeuvring of the traction stand.
Correction of varus or valgus malalign-
t was achieved by rotating the short por-
of the traction stand in a clockwise or Correction of varus or valgus malalignment was achieved by rotating the short por-
tion of the traction stand in a clockwise or
counter-clockwise direction, after temporment was achiev tion of the traction stand in a clockwise or $\frac{1}{2}$ counterarily loosening the attachment of clamp clockwise direction, after tempor-
bening the attachment of clamp
this bar. In this way, the tip of this
moved higher or lower than the arily loosening the attachment of clamp
holding this bar. In this way, the tip of this
bar was moved higher or lower than the
starting point. For example, elevation of the holding this bar. In this way, the tip of this
bar was moved higher or lower than the
starting point. For example, elevation of the
tip of this bar resulted in correction of a valstarting point. For example, elevation of the was moved higher or lower than the
ting point. For example, elevation of the
of this bar resulted in correction of a val-
malalignment of the tibia that was being starting point. For example, elevation of the
tip of this bar resulted in correction of a val-
gus malalignment of the tibia that was being
exposed using a medial approach. However. tip of this bar resulted in correction of a valgus malalignment of the tibia that was being
exposed using a medial approach. However,
this technique was not found to be useful exposed using a medial approach. However, alalignment of the tibia that was being
the dusing a medial approach. However,
echnique was not found to be useful
the tibia was positioned for the bilatexposed using a medial approach. However,
this technique was not found to be useful
when the tibia was positioned for the bilat-
eral approach. In this instance, correction of this technique was not found to be useful
was positioned for the bilat-
In this instance, correction of
deformity was performed by when the tibia was positioned for the bilat-
eral approach. In this instance, correction of
valgus or varus deformity was performed by
loosening the clamp, and sliding the entire valgus or varus deformity was performed by roach. In this instance, correction of
or varus deformity was performed by
g the clamp, and sliding the entire
stand along the lateral rail of the raigu
10000 is or varus deformity was performed by
ning the clamp, and sliding the entire
on stand along the lateral rail of the
either in a medial or lateral direction. roosonnig.ui
turning.org respectively. Equipment and all the left and the correct for procurvatum or recur-
pectively.
To correct for procurvatum or recur-
um malalignment, for all the positions

Figure 1.
The bilateral approach to the tibia.
The bilateral approach to the tibia. To correct for procurvatum or recurvatum malalignment, for all the positions except for the bilateral approach to the tibia, the clamp was loosened, and entire traction except for the bilateral approach to the tibia, n malalignment, for all the positions
to the bilateral approach to the tibia,
amp was loosened, and entire traction
was pushed horizontally along the latexcept for the bilateral approach to the tibia,
the clamp was loosened, and entire traction
stand was pushed horizontally along the lat-
eral rail of the table. The clamp and the constand was pushed horizontally along the latmp was loosened, and entire traction
was pushed horizontally along the lat-
1 of the table. The clamp and the con-
traction stand were pushed toward oui
ana nd was pushed horizontally along the lat-
I rail of the table. The clamp and the con-
ted traction stand were pushed toward
cranial part of the dog for the correction $\frac{1}{2}$ al rail of the table. The clamp and the concted traction stand were pushed toward
e cranial part of the dog for the correction
procurvatus, and toward the caudal part mected traction stand were pushed toward
the cranial part of the dog for the correction
of procurvatus, and toward the caudal part
for the correction of recurvatus. In the posiof procurvatus, and toward the caudal part Frama part of the tog for the correction
rocurvatus, and toward the caudal part
the correction of recurvatus. In the posi-
for the bilateral approach to the tibia. of procurvatus, and toward the caudal part
for the correction of recurvatus. In the posi-
tion for the bilateral approach to the tibia,
the technique of upward or downward roto the solution of the shorter values. In the posi-
tion for the bilateral approach to the tibia,
the technique of upward or downward ro-
tation of the shorter part of the traction stand for the correction of the correction
ique of upward or downward ro-
the shorter part of the traction stand
for the correction of procurvatum the technique of upward or downward roreferent of the traction stand
experience correction of procurvatum
malalignment, respectively.

 ¹⁸ cases we experienced problems slipping of the traction bands from the In 18 cases we experienced problems
with slipping of the traction bands from the
metacarpus or metatarsus during loading.
This problem was overcome by repositionwith slipping of the traction bands from the with slipping of the traction bands from the
metacarpus or metatarsus during loading.
This problem was overcome by reposition-
ing the bands, or by placing them around the metacarpus or meta tarsus during loading.
vercome by reposition-
placing them around the
or the distal end of the This problem was overcome by reposition-
ing the bands, or by placing them around the
distal antebrachium or the distal end of the
tibia, or by using a traction stirrup instead of bands.
distal antebrac bands.

Discussion

SKED SKELER
Skeletal traction was relatively **PEREFERENTIFE**

Performing skeletal traction was relatively

straightforward for each skeletal segment.

The loss of load in the first phase of the tracstraightforward for each skeletal segment. be compared to the comparent was relatively ghtforward for each skeletal segment.

loss of load in the first phase of the trac-

procedure was apparently due to the elasticity which is the various elements.
The loss of load in the first phase of the trac-
tion procedure was apparently due to the
elasticity of the various elements of the systion procedure between the soft tissues of the the procedure was apparently due to the sicity of the various elements of the system cluding the soft tissues, the anchor-
bands. and the traction bands which elasticity of the various elements of the sys-
tem, including the soft tissues, the anchor-
age bands, and the traction bands which
seem to absorb most of the force annlied at tem, including the soft tissues, the anchor-
the traction bands which
b most of the force applied at
this reason, the traction stand age bands, and the traction seem to absorb most of the force applied at pose in the absort
low loads. For to absorb most of the force applied at
aads. For this reason, the traction stand
engthened much more in the early
than in the later stages to achieve the this reason, the traction stand
ed much more in the early
the later stages to achieve the
in force applied to the skeletal was renguence in was lengthened much more in the early
phase than in the later stages to achieve the
same increase in force applied to the skeletal
segment. Once the elasticity of the system force applied to the skeletal
force applied to the skeletal
he elasticity of the system
he correlation between bar
force applied was almost segment. Once the elasticity of the system
was overcome, the correlation between bar
lengthening and force applied was almost
directly linear. The small loss of tension dur-

300

 the half an hour after the peak force of 25 the half an hour after the peak force of 25 weight that was achieved showed that it is ing the half an hour after the peak force of 25 kg weight that was achieved showed that it is possible to maintain the applied force for kg weight that was achieved showed that it is periods without significant variations
ight that was achieved showed that it is
ible to maintain the applied force for
periods without significant variations from the weight that
possible to n long periods without significant variations Final and application of the manual application of trac-
the manual application of traclong periods without significant variations
from the steady state. This is usually not
possible with the manual application of trac-
tion due to variations in the forces applied. from the steady sta te. This is usually not
hual application of trac-
s in the forces applied.
traction bands and stirpossible with the manual application of traction due to variations in the forces applied.
The behaviour of the traction bands and stir-
rup were different. The bands were easy and tion due to variations in the forces applied.
The behaviour of the traction bands and stir-
rup were different. The bands were easy and
quick to use, but they were prone to slide. The behaviour of the traction bands and stirent. The bands were easy and
ut they were prone to slide.
was definitely hindered by rup were different. The bands were easy and rent. The bands were easy and
but they were prone to slide.
e was definitely hindered by
bands which would certainly The procedure was definitely hindered by ick to use, but they were prone to slide.

e procedure was definitely hindered by

ding of the bands which would certainly

a problem in clinical practice if it oc-The procedure was definitely hindered by
sliding of the bands which would certainly
be a problem in clinical practice if it oc-
curred during fracture reduction. Greater sliding of the bands which would certainly
iical practice if it oc-
re reduction. Greater
traction stand was be a problem in clinical practice if it octhe reduction. Greater
traction stand was
the elastic phase of the territive during
lengthening of bands, in contention. Secure
the stand was
the overcome the elastic phase of the
bands, in comparison to the traction
because the stirrup had minimal required to overcome the elastic phase of the
traction bands, in comparison to the traction
stirrup because the stirrup had minimal
elastic behaviour. Excessive mechanical traction ban
stirrup beca bands, in comparison to the traction
because the stirrup had minimal
behaviour. Excessive mechanical
may also be potentially dangerous. aluse the strip had infinited
aviour. Excessive mechanical
also be potentially dangerous,
evaluation of the technique is required. and clinical evaluation of the technique is required.

red.

The greater tendency for axial displace-

of the bone fragments following the required.
The greater tendency for axial displacement of the bone fragments following the
osteotomy of the humerus and femur, in $\frac{1}{10}$ comparison to the bone bone fragments following the
of the humerus and femur, in
with the antebrachium and to the greater difficulty in
the antebrachium and
tibia. is likely due to the greater difficulty in comparison with the antebrachium and
tibia, is likely due to the greater difficulty in
matching the traction axis with these skelcomparison with the antebrachium and
tibia, is likely due to the greater difficulty in
matching the traction axis with these skel-
etal segment and surrounding musculature.

we found that angular malalignever, we found that angular malalign-
resulting from mid-diaphyseal osteot-However, we found that angular malalign-
ment resulting from mid-diaphyseal osteot-
omies of the major appendicular skeletal ment resulting from mid-diaphyseal osteotwe found that angular malalign-
liting from mid-diaphyseal osteot-
the major appendicular skeletal
of dogs could be consistently cormont i to achieve an accurate reduction by
to achieve an accurate reduction by viii
... ies of the major appendicular skeletal
ments of dogs could be consistently cor-
ted to achieve an accurate reduction by
manoeuvres using a purpose built tracsegments of dogs co
rected to achieve an
the manoeuvres usin
tion stand and table. tion stand and table.

Acknowledgements
The arthor would like

authors would like to acknowledge Med Matrix.
authors would like to acknowledge Med Matrix. **Italy, for providing the acknowledge Med Matrix,**
Italy, for providing the equipment needed to
this study. One of the authors (GLR) was part The authors would like to acknowledge Med Matrix,
Modena, Italy, for providing the equipment needed to
perform this study. One of the authors (GLR) was part
of a team that develoned the surgical table Ergomed Modena, Italy, for providing the equipment needed to .,...
..... 99.

1.Johnson**References**

- **nces**
son AL. Current concepts in fracture reduc-
Vet Comp Orthop Traumatol 2003: 16: 59–66.1. Johnson AL. Current concepts in fracture reduction. Vet Comp Orthop Traumatol 2003; 16:
59–66.
2. Latte Y. Reduction de la fracture. In: Latte Y. tion. Vet Comp Orthop Traumatol 2003; 16:
59–66. Comp Orthop Traumatol 2003; 16:
Reduction de la fracture. In: Latte Y,
J-A (eds). Manuel de fixation externe.
- 59–66.
Latte Y. Reduction de la fracture. In:
Meynard J-A (eds). Manuel de fixation
Editions PMCAC. Paris. 1997: 117–24. Editions PMCAC, Paris, 1997; 117-24.

Editions PMC
Correspondence to: Italy

د
Correspondence to:
Gian Luca Rovesti, drMedVet, Diplomate ECVS Ambulatorio Veterinario Associato M. E. Miller Correspondence to:
Gian Luca Rovesti, drMedVet, Dip
Ambulatorio Veterinario Associato
42025 Cavriago, Reggio Emilio
Italy
Phone: +39 0522 371044, Fax
E-mail: arovesti@clinicamiller.it Phone: $+39$ 0522 371044, Fax: $+39$ 0522 576183