

Fig. E-1

Schematic showing interfragmentary strain (IFS) with a stiff construct (LS group, left) and a dynamic construct (DLS group, right).

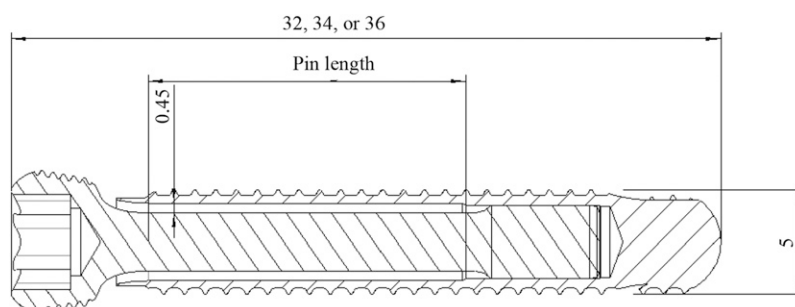


Fig. E-2

Geometric details of the dynamic locking screw. Dimensions are given in millimeters.

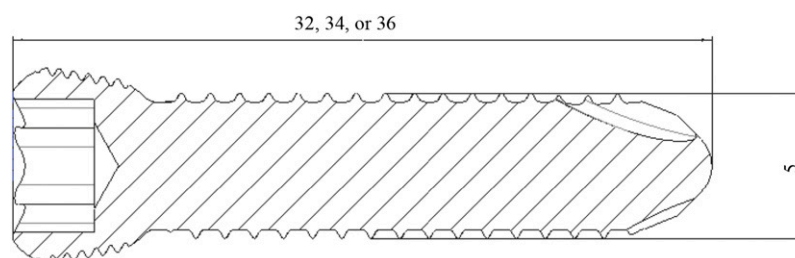
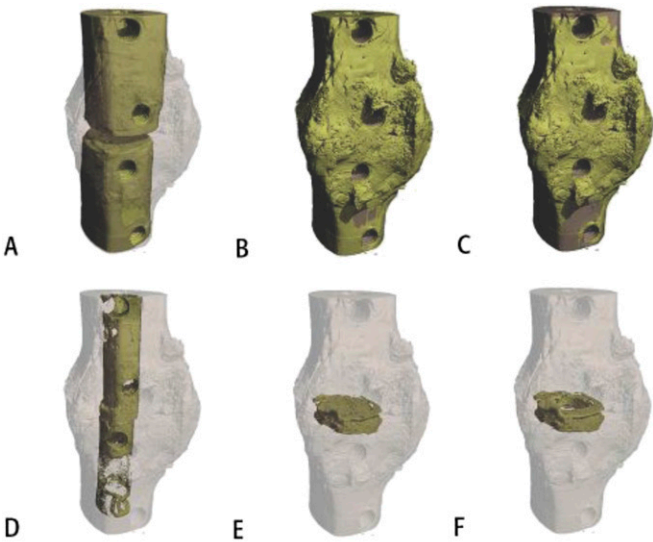


Fig. E-3

Geometric details of the locking-head screw. Dimensions are given in millimeters.



A: bone volume
B: total callus volume
C: external callus
D: endosteal callus
E: gap callus
F: ring gap callus

Fig. E-4
Schematic showing μ CT volumes of interest (VOIs).

TABLE E-1 Products Used in the Study

Sedation	
Xylazine	0.1 mg/kg (Streuli Pharma, Uznach, Switzerland)
Buprenorphine	0.01 mg/kg (Temgesic; Essex Chemie, Luzern, Switzerland)
Anesthesia	
Diazepam	0.1 mg/kg (Valium; Roche Pharma, Reinach, Switzerland)
Ketamine	3-5 mg/kg (Narketan 1; Vetoquinol, Ittigen, Switzerland)
Propofol	0.2-0.4 mg/kg (Propofol 1% MCT Fresenius; Fresenius Kabi, Oberdorf, Switzerland)
Propofol constant-rate infusion	0.01-0.03 mg/kg body wt/min (Propofol 1% MCT Fresenius; Fresenius Kabi)
Isoflurane	1-1.5 vol% (IsoFlo; Abbott, Baar, Switzerland)
Analgesia	
Buprenorphine	0.01 mg/kg (Temgesic; Essex Chemie)
Carprofen	4 mg/kg (Rimadyl; Pfizer, Zürich, Switzerland)
Antibiosis	
Benzylpenicillin	30,000 IU/kg (Penicillin Natrium Streuli; Streuli Pharma)
Gentamicin	4 mg/kg (Vetagant; Veterinaria, Zürich, Switzerland)
Carprofen	4 mg/kg (Rimadyl, Pfizer)
Other compounds	
Tetanus serum	3000 IU (Tetanus-Serum Intervet; Veterinaria)
Chlorhexidine gluconate	HiBiSCRUB (Regent Medical, Manchester, United Kingdom)
Surgery	
Dynamic locking screw	DLS (product no. 09.223; Synthes, Solothurn, Switzerland); 5.0 mm diameter, self-tapping, CoCrMo
Locking-head screw	Self-tapping locking screw (LS; Synthes)
Locking compression plate	LCP 4.5/5.0, Broad (product no. 426.561; Synthes); 4.5-5.0 mm diameter, 115.8 mm length, 17.5 mm width, 6 mm thickness, titanium
Drill guide	3.2-mm diameter (product no. 324.176; Synthes)
LCP drill bit	3.2-mm diameter (product no. 310.310; Synthes)
Monocortical locking screws	4.0-mm diameter locking screws, 16-18 mm length, steel (product nos. 02.204.016-18; Synthes)
Screwdriver	StarDrive T25 (product no. 314.119; Synthes)
Torque limiter	4 Nm limit (product no. 511.774; Synthes)
Oscillating saw	Saw with 70/49 × 14 × 0.6/0.4 mm blades (product no. 519.150; Synthes)
Depth gauge	Product no. 319.100 (Synthes)
Suture	2-0 VICRYL (Johnson & Johnson Int., Brüssel, Belgium)
Skin staples	Auto Suture Appose ULC 35W (product no. 8886803712; United States Surgical, Norwalk, Connecticut)
Cast	Scotchcast Plus, 7.6 cm (Laboratoires 3M, Santé, France)
Diagnostic imaging	
Mobile radiography unit	Diagnostic x-ray unit (model orange 8016 HF; Raymed Medical X-ray, Düringen, Switzerland)
Radiographs	24 × 30 cm, IP Cassette type C (Fuji Film)
Harvesting of samples	
Digital camera	Reflex camera, overview F5.0 1/125, macro F8.0 1/200 (D5000; Nikon, Egg bei Zürich, Switzerland)
Biomechanical testing	
Servohydraulic material testing machine	Model 858 Mini Bionix, load cell range 0-100 Nm (MTS, Eden Prairie, Minnesota)

continued

TABLE E-1 (continued)**Histology**

Macroscopic	Z6 APO A (Leica Microsystems, Heerbrugg, Switzerland) with digital camera (DFC 420 C; Leica Microsystems)
Series of ethanol solutions	40%, 50%, 70%, 80%, 90%, 96%, 100%
PMMA	Methacrylic acid methyl ester (Fluka Chemie, Buchs, Switzerland), dibutylphthalate (Merck Schuchardt, Hohenbrunn, Germany), and Perkadox 16 (AkzoNobel Polymer Chemicals, Amersfoort, The Netherlands) in a ratio of 89.5:10:0.5
Diamond saw	Exakt Band System 300/301, Exakt Apparatebau GmbH & Co KG, Norderstedt, Germany
PMMA slides	Perspex GS Acrylglass Opal 1013 (Wachendorf, Basel, Switzerland)
Transparent plastic slides	PMMA transparent, EP 2 mm (Maagtechnik, Dübendorf, Switzerland)

Microradiography

Radiographs	Faxitron cabinet x-ray system (model 43855A; Hewlett-Packard, McMinnville, Oregon) operated at 55 kV, 6 s
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Evaluation

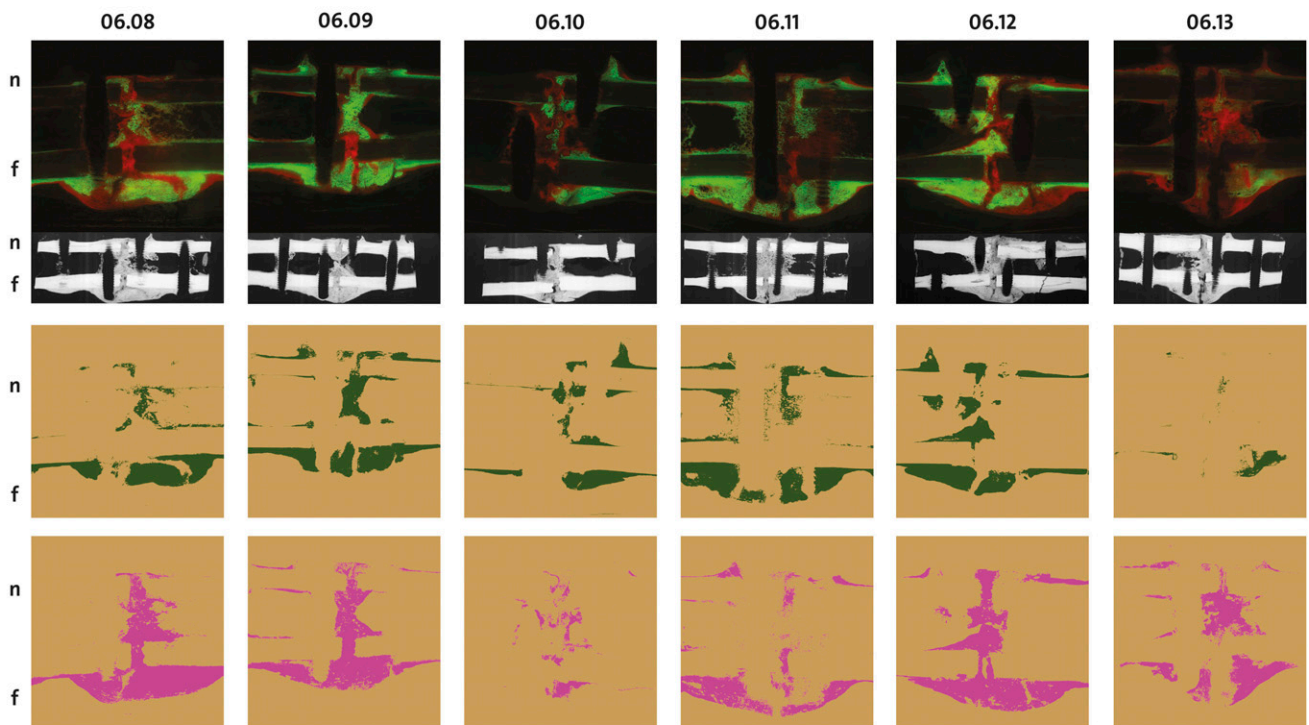
Image viewing software	OsiriX Imaging Software (Version 3.8.1; Pixmeo, Bernex, Switzerland)
μ CT measurements	μ CT 100 (SCANCO Medical [formerly b-Cube], Brüttisellen, Switzerland) operated at 70 kVp, 200 ms, nominal isotropic resolution (49.2 μ m), Gaussian three-dimensional filter ($\sigma = 1.2$, filter support = 1)
Archive program	ImageAccess (Imagic, Glattbrugg, Switzerland)
Histomorphometry	QWin/Quips (Leica Microsystems), specific and customized evaluation software for histomorphometry
Statistical analysis	SPSS for Macintosh OS X (version 19.0; IBM, Armonk, New York)
Image file format	TIFF (Tagged Image File Format)

Appendix E-1 Fluorescence, Radiographic, and Histomorphometric Images

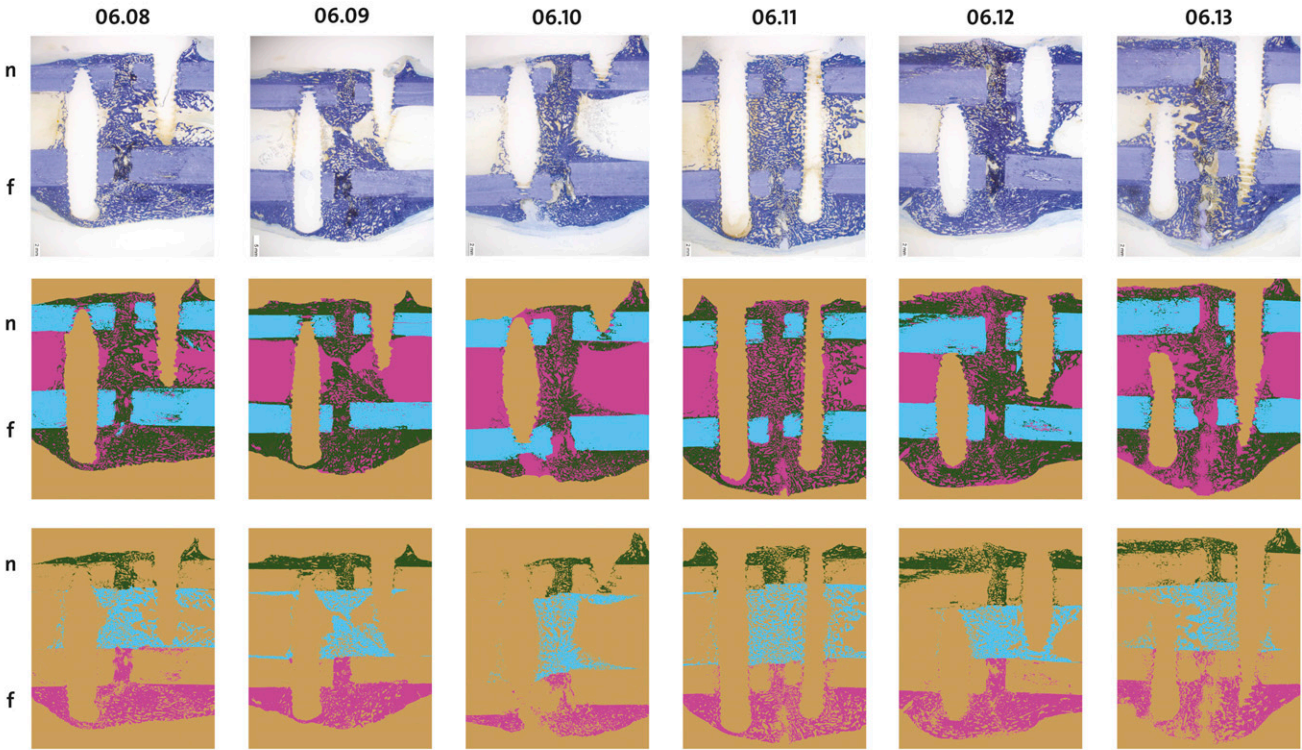
The first and second sets of eighteen images show the animals in the DLS group (numbered 06.08 through 06.13), and the third and fourth sets show the animals in the LS group (numbered 06.01 through 06.05 and 06.20); n = near cortex, and f = far cortex. Upper portion of top row in first and third sets: fluorescence images (evaluation of these results is not discussed in the text); the green results from calcein green injected subcutaneously at postoperative week four and the red results from xylenol orange injected subcutaneously at postoperative week seven. Lower portion of top row in first and third sets: microradiographs. Middle row in first and third sets: histomorphometric images showing calcein green staining. Bottom row in first and third sets: histomorphometric images showing xylenol orange staining. Top row in second and fourth sets: histologic images showing toluidine blue staining. Middle row in second and fourth sets: histomorphometric images showing tissue fractions (blue = bone [old matrix], green = callus [new matrix], magenta = fibrous tissue, and beige = background). Bottom row in second and fourth sets: histomorphometric images showing callus fractions in relation to the whole bone volume (green = callus at the near cortex, magenta = callus at the far cortex, blue = callus in the interior of the bone [endosteal], and beige = background).



Group DLS

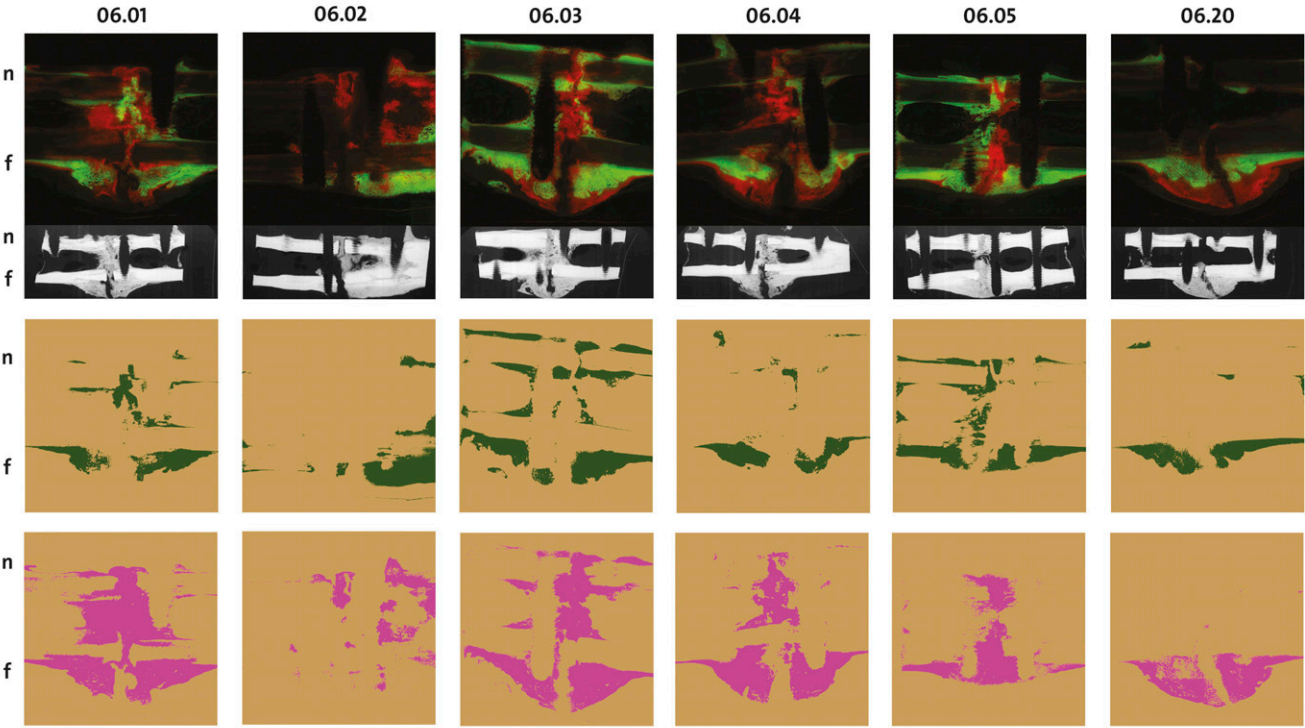


Group DLS



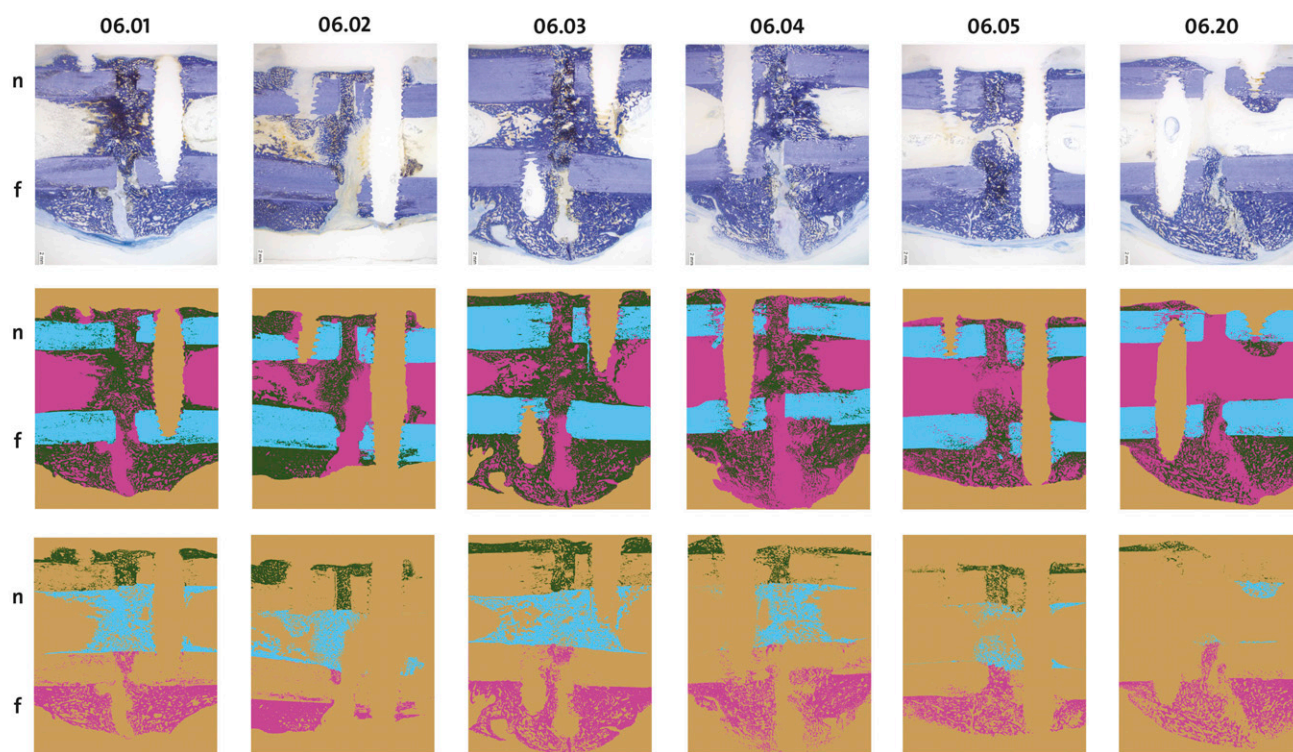
Dr. med. vet. Henning Richter

Group LS



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Group LS



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