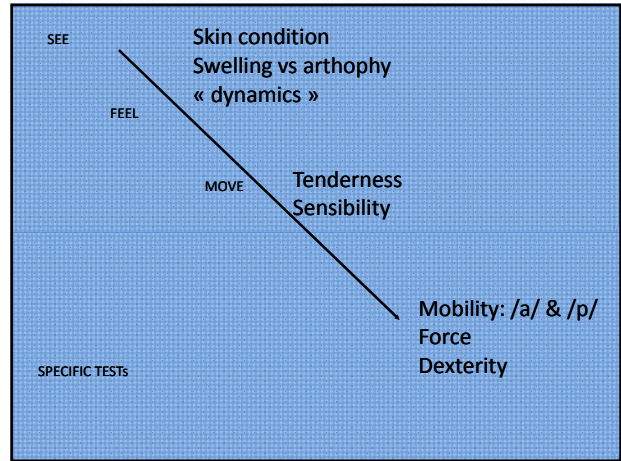


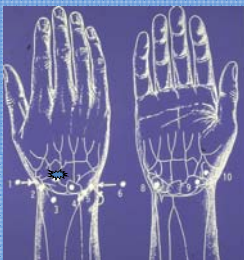
ACTUELE ASPECTEN VAN POLSLETSELS:
 diagnose – behandeling - evaluatie

Luc De Smet MD PhD
 UZ- Leuven



Feel...

Semiology: the wrist



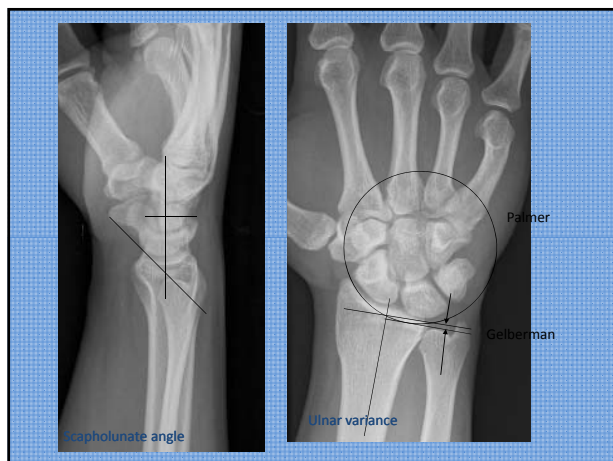
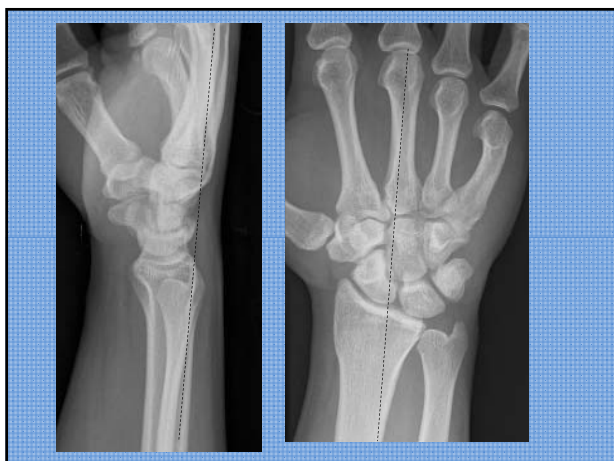
1. Anatomical snuffbox
 2. Radial styloid
 3. Lister's tubercle
 4. Lunate
 5. Ulnar head
 6. Ulnar styloid
 7. Triquetrum
 8. Pisiform
 9. Tubercle of scaphoid
 10. Trapezium
- ☀ Crucifix point

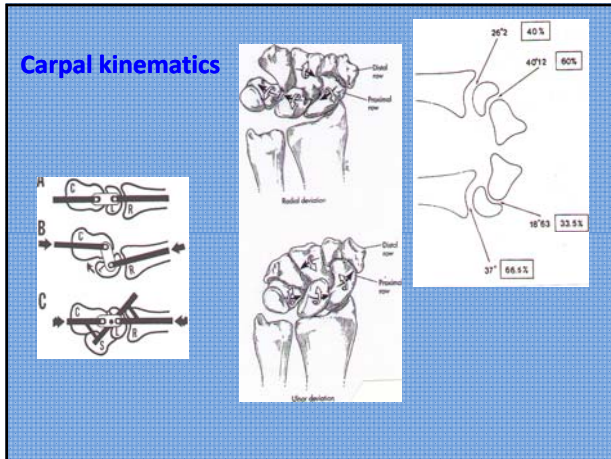
Semiology: performance

- POWER: Grip, key pinch, pulpopulpar pinch
- Dexterity: take5, 9-pegboard, moberg pick-up...
- Function : BTE, Jebsen, ADL, ...
- Sensibility
- Social function

IMAGING TECHNIQUES

- Radiography
- Ultrasound
- Scintigraphy
- CT scan
- Arthrography
- MRI
- Arthroscopy
- others





What is the goal?

**ARTHRODESIS OF THE WRIST FOR OSTEOARTHRITIS:
OUTCOME WITH A MINIMUM FOLLOW-UP OF 4 YEARS**

L. DE SMET and J. TRUYEN

From the Department of Orthopedic Surgery, U.Z. Pellenberg, Weligerveld, 1, Lubbeek (Pellenberg), Belgium

The outcome of total wrist arthrodesis was reviewed in 36 patients with osteoarthritis after a minimum follow-up of 4 years. Pain relief was not complete, and although 20 were pain free at rest, only six were pain-free during manual activity. Grip strength was 63% of the contralateral side and the DASH score remained high. Only 21 of the 34 could be re-employed. The mean time off work was 14 months. Complications were numerous and additional surgery was required in 21 patients. *Journal of Hand Surgery (British and European Volume, 2003) 28B: 6: 573-577*

Keywords: wrist, arthrodesis, arthritis, outcome, gripping force

Arthrodesis: gripping force

• Sauerbier (2000)	50 %
• Leighton (1987)	50 – 75%
• Dap (1992)	60%
• O’Bieme (1955)	66%
• Field (1996)	74%
• Wiedeman (1997)	77%
• Sharin (1998)	85%
• Houshian (2001)	88%

Arthrodesis: DASH

• Sauerbier (2000)	51
• Kalb (1999)	46
• Solem (2006)	38

Enkele pathologieën en hun "management"

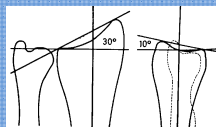
- Distale radius fracturen
- TFCC
- Scaphoid en scapholunair ligament
- Arthrose en salvage
- Andere.....

OUTCOME of WRIST FRACTURE

- PAINFREE
 - Radiocarpal <-> IA dyscongruency
 - DRUJ <-> radial shortening & dorsal tilt
 - Ulnocarpal <-> ulnar impaction
- GOOD (HAND)FUNCTION
 - ROM of wrist: how much do you need
 - Handfunction: Stiff fingers CRPS
 - Gripping force
- COSMESIS
- ABSENCE of COMPLICATIONS

What can be tolerated?

- Dorsal tilt:
 - > 20° biomechanical problems in the DRUJ, altered contact area and force transmission and midcarpal subluxation
 - Hobart & Kauf: max 0°
 - De Palma/Lidström: max 5°
 - Zemel: max 10°
 - Fernandez: > 25 to 30°



What can be tolerated?

- Shortening:
 - 4 to 6 mm ulnar impaction
 - > 2mm altered contact area
- Joint incongruity
 - > 1 - 2mm: more osteoarthritis



**Malunion of the radius:
what is important?**

- Stoffelen et al , JHS 23B, 1998
 - Shortening > 3 mm
 - Dorsal tilt > 5°
 - Radial shift > 2mm
 - Radial inclination : NS
 - DRUJ instability
 - Ulnar styloid fracture

**WRIST FRACTURES:
Anatomical goals**

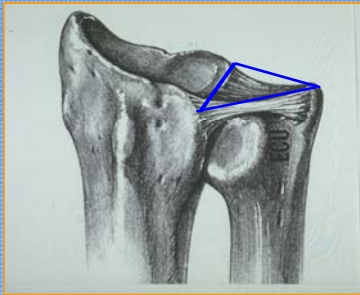
- Restoration of UV
- Restoration of articular surface
- Restoration of dorsal tilt
- Minimal invasive
- RSD prevention
- Early mobilization

EBM: no evidence

- Manipulation or not
- Delayed or immediate
- Traction vs manipulation
- Immobilisation or not
- Position forearm or wrist
- Duration immobilisation
- Plaster or brace
- Material of casting

Author	year	N	population	Redisplacement%
Leung et al	2000	111	IA young adults	28
Smilovic & Bilic	2003	54	EA all	55
Sommer et al	2001	59	all	59
Kwasn et aly	1991	120	all	9 to 42
Zamzam & Khoshhal	2005	183	children	25
Miller et al	2005	34	children	39
Dayican et al	2003	108	elderly	26
Young et al	2003	85	all	50
Beumer	2003	60	Low demand	89
Anzarut et al	2004	74	elderly	36
Earnshaw et al	2002	225	all	81
Bong et al	2006	85	all	33

TFCC

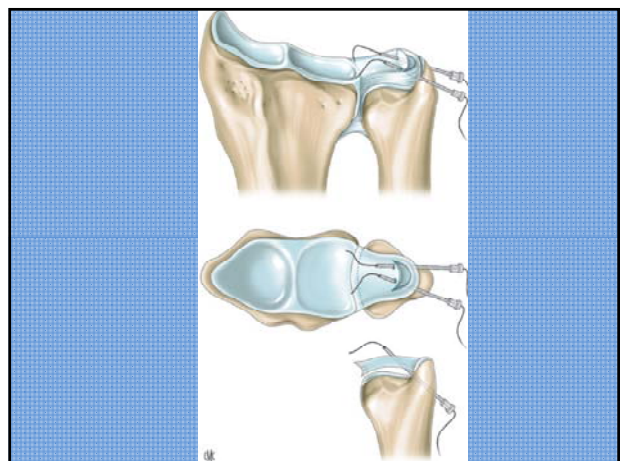
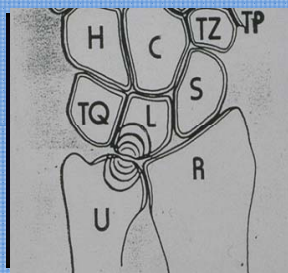


TFCC LESIONS (Palmer 1989)

- Trauma: types
 - 1 central
 - 2 ulnar (+/- #)
 - 3 distal
 - 4 radial
 - Degeneration: stages
 - 1 TFC wear
 - 2 id + chondromalacia
 - 3 TFC perforation + chondrom.
 - 4 (3) + LT rupture
 - 5 + ulnocarpal arthritis
- = 2 different pathologies!

INTERACTIONS!

- ULNAR VARIANCE
- DRUJ
- TFCC
- CARPUS
 - Bones and cartilage
 - Ligaments



Open repairs ?

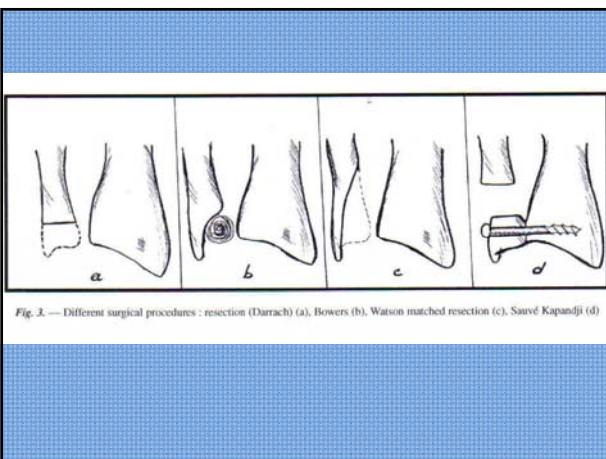
- Reinsertion
 - Limited indications
- ORIF styloid
 - Extended indications
- Open debridement
 - Are there indications?



FAILED ARTHROSCOPY: TREATMENT OPTIONS

All based on decompression of the ulnocarpal joint :

- Darrach (1952)
- Sauvé - Kapandji (1936)
- Ulnar shortening osteotomy (Milch, 1942)
- Bowers (1985)
- Watson (1986)
- DSS osteotomy



ULNAR SHORTENING OSTEOTOMY : RATIONALE

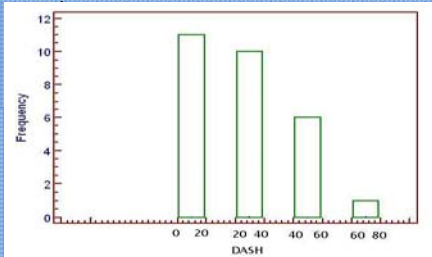
- Extra-articular procedure
 - = theoretical advantage
 - » DRUJ intact
 - » Peripheral aspect of TFCC intact
- Palmer et al (1982 and 1984) :

Loading pressure across the wrist : ulnocarpal joint

18 % 2,5 mm shortening 4,3 %

Ulnar shortening osteotomy

Postoperative DASH: Excellent + Good: 21, Fair: 6,



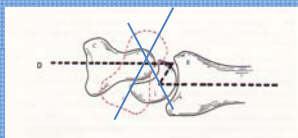
Scapholunate rupture: pathogenesis



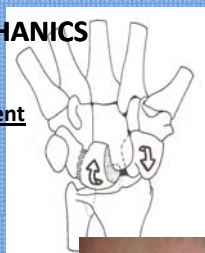
Mayfield's progressive perilunate instability

ANATOMY and BIOMECHANICS

Rupture of scapho-lunar ligament



DISI deformity



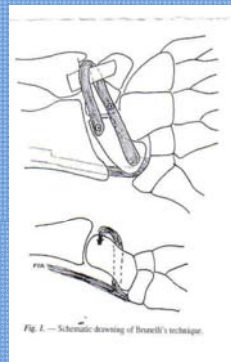
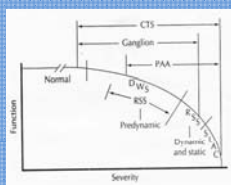
SLAC: pathogenesis



Staged spoon mechanism

SCAPHOLUNATE INSTABILITY

- Pre-dynamic
- Dynamic
- Static
- Scaphoid Fixed
- Degenerative (SLAC)
- Full Wrist Osteoarthritis



TYPE A: STABLE ACUTE FRACTURES

A1 FRACTURE OF TUBERCLE
A2 INCOMPLETE FRACTURE THROUGH BASE

TYPE B: UNSTABLE ACUTE FRACTURES

B1 DISTAL SINGLE FRACTURE
B2 COMPLETE FRACTURE OF BASE
B3 PROXIMAL POLE FRACTURE
B4 TRANS-SCAPHOID-PELLOUS FRACTURE DISLOCATION OF CARPUS

TYPE C: DELAYED UNION

C DELAYED UNION

TYPE D: ESTABLISHED NONUNION

D1 FIBROUS UNION
D2 PSEUDARTHROSES

Herbert & Fisher, 1984

A rational approach to treatment of acute scaphoid fractures

TYPE B (1,2,3,4,5) : UNSTABLE

= all the other acute fractures

- undisplaced can be unstable
- displaced = unstable
- complete (2 cortices)
- proximal pole fracture = always unstable

- **delayed union = common**

- **internal fixation**



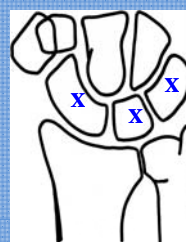
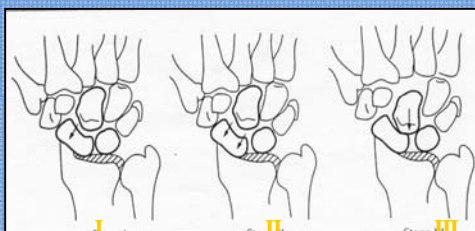
Arthrose van de pols en hoe een arthrodesse vermijden



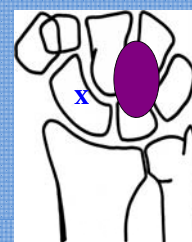
Alternatives

- Partial arthrodesis
 - 4 corner
 - Chamay mod Garcia Elias
- Arthroplasty
 - Resection: PRC
 - Osteochondral graft
 - Prosthesis
- Denervation

SLAC wrist (Watson1984): staging



PRC: stage I, II



4-corner: stage III

Denervation? Or arthrodesis?

OUTCOME PRC

	N	force	DASH		N	force	DASH
Crabbe	20	63		Luchetti	9	77	
Jorgensen	22	109		Nakamura	7	62	
Inglis & Jones	13	100		Inoue & Miura	16	63	
Schernberg	20			Retting & Raskin	12	80	
Neviasser	24	100		Cohen & Scott	19	71	
Neviasser	31	98		Nagelvoort	11	70	28
Green	15	83		Wielby & Alhot	27	74	
Imbrogliola	27	90		Lukas	14	66	36
Feric	16	60		Trackle	33	54	28
Foucher & Chmiel	20	60		Streich	17	73	28
Alnot & Bleton	48			Jebson	20	83	
Tomaino	23	79		Didonna	22	72	9
Begley & Engber	14	72		Pellenberg	51	71	18
Krakauer	12	66					
Wyrick	10	94					
Salomon & Eaton	12	62					
Steenwerckx	27	60					

Force 54 – 109%
DASH 9- 36

OUTCOME 4 CORNER

	N	F	ROM	DASH
Kirschenbaum	18	67	62	
Tomaino	9	76	52	
Ashmon (Watson)	100	81	74	
Krakauer	23	79	54	
Wyrick	17	74	67	
Gill & Ireland	24	70	74	28
Sauerbier	36	65	99	28
Krimmer	97	65	33	33
Garcia Lopez	16	50	49	
Cohen & Scott	19	79	80	
Kadji	41	77	55	
Lukas	12	61	71	30
Bertrand	17	59	70	
Degregorio	57	79	92	
Voche	12	53	45	
Pellenberg	19	67	84	39

Force 50 – 81%
ROM 33 – 99°
DASH 28 - 39

RADIOCARPAL ARTHRODESIS

- Radiolunate arthrodesis
– (Chamay 1986)
- Radioscapholunate arthrodesis
- Radioscapholunate arthrodesis with resection of the distal scaphoid pole
– (Garcia Elias 2005)

Reconstruction of the Distal Radius Facet by a Free Vascularized Osteochondral Autograft: Anatomic Study and Report of a Patient

Francisco del Piñal, MD, Francisco J. García-Bernal, MD, Julio Delgado, MD, Marcos Sanmartín, MD, Javier Regalado, MD, Santander, Spain

Purpose: Large chondral defects of the distal radius after fractures present a reconstructive challenge. The purpose of this study was to present the anatomic findings from a cadaver of a vascularized osteochondral autograft taken from the third metatarsal appropriate for reconstructing the distal radius articular facet. A patient is presented in whom 70% of the scaphoid fossa was reconstructed with this technique.

Methods: The base of the third metatarsal was studied in the feet of 20 cadavers. The size and shape of the cartilage were measured. Additionally, vessel distribution was recorded and the diameters of vascular foramina were measured with Juch's method.

Results: The base of the third metatarsal is pear shaped and is wider dorsally than plantarily. It averages 19.2 mm long on its main axis. Its cartilaginous surface is minimally concave or flat and it is slanted slightly proximal-dorsal to distal-plantar and proximal-personal to distal-plantar. Nutrient foramina were found in every case in the dorsum and on both sides of the proximal shaft. At least 1 nutrient vessel could be tracked back to the dorsalis pedis in every dissected specimen.

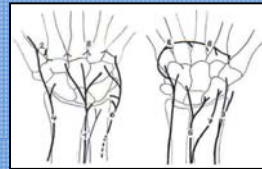
Conclusions: The anatomic features of the base of the third metatarsal make it a potential vascularized autograft to consider for osteochondral defects of the distal radius. (J Hand Surg 2005; 30A:1200.e1-1200.e14. Copyright © 2005 by the American Society for Surgery of the Hand.)

Key words: Osteochondral defects, intra-articular distal radius malunion, distal radius osteotomy, free flap.

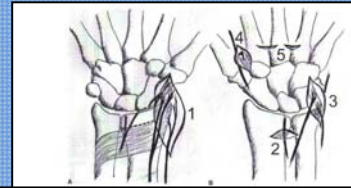
PROSTHETICS?



DENERVATION



Wilhelm 1966



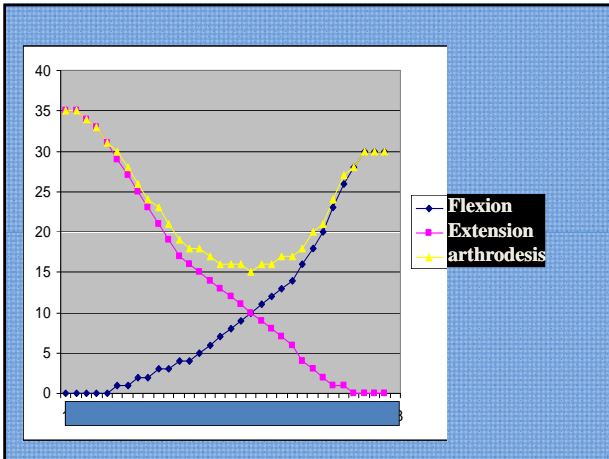
Denervation; what to expect?

Schweizer et al / Wrist Joint Denervation 563

Study	Number	Additional Procedures*	Follow-Up Period, mo	Results
Wilhelm, ⁶ 1966	21 partial	19%	16	80% success rate
Geldmacher et al. ⁹ 1972	24 complete, 8 partial	75%	No data	84% success rate
Buck-Gramcko, ¹⁰ 1974	5 complete, 26 partial	35%	28	13% no pain, 55% slight pain
Buck-Gramcko, ¹¹ 1977	30 complete, 165 partial	No data	48	26% complete, 43% partial pain relief
Helmeke et al. ²⁹ 1977	54 complete	28%	37	83% positive
Stegemann et al. ²⁸ 1980	26 complete	88%	~30	81% positive
Roslund et al. ¹² 1980	9 complete	None	24	89% improvement
Martini et al. ¹³ 1983	33 complete/partial	54%	24	84% success rate
Ekerot et al. ¹⁴ 1983	48 complete/partial	None	28	56% pain relief
Dellon, ⁷ 1985	29 partial	None	35	90% improvement
Foucher et al. ¹⁵ 1992	50 complete	40%	48	72% improvement
Buck-Gramcko, ¹⁶ 1993	61 complete/partial	77%	74	76% very or remarkably satisfied
Nishi et al. ¹⁷ 1993	17 complete, 12 partial	41%	51	24% satisfied
Ferreus et al. ¹⁸ 1995	22 complete, 30 partial	None	65	Complete better than partial
Grechenig et al. ¹⁹ 1998	22 complete	27%	50	77% satisfied
Foucher et al. ²⁰ 1998	50 complete	None	60	74% pain relief
Weinstein and Berger, ⁴ 2002	19 partial	None	30	85% pain relief, 85% satisfied
Present study, 2004	761 (sum), 24 (mean)		45 (mean)	75% improvement (mean)
	71 complete		113	67% improvement

SCHADE

- OBSI : ROM E/F
- Ankylose = 15%
- Kracht
- Restpijnen
- Instabiliteit??



Europese schaal

- Ankylose**

	D	ND
Arthrodesis of ankylose in werkingspositie		
• bewaarde pro- en supinatie	10 %	8 %
• verloren pro- en supinatie	20 %	16 %

- Stijfheid**

	D	ND
Stijfheid in de zantige sector		
• gebrek aan flexie	0,4 %	0,3 %
• gebrek aan extensie	0,6 %	0,5 %
Verlies van cubitale deviatie	1,5 %	1 %

- ### AMA
- Wrist = 60% upper limb
 - Instabiliteit = radiologisch!!!!

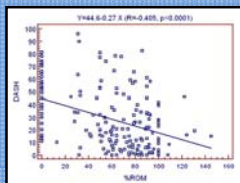
- ### How much ROM does one need
- Palmer: E/F 30/5
 - Ryu E/F 54/60
 - Brumsfield E/F 15/10
 - This is what you use, not what you need

How much ROM does one need

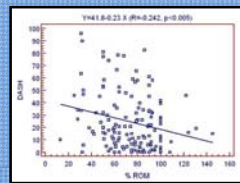
Nelson (1997) TAM 11°
 able to do 90% of all ADL's
 but not always comfortable



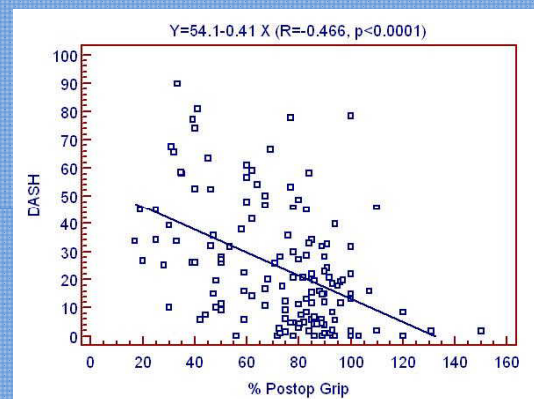
- N = 205
- 9 types of reconstructive wrist surgery
 - PRC, US, VBG, scaPs-A, A-desis, SLig, LT lig, ostetomy radius, 4-corner
- 71 F/ 134 M
- Age 42 (10 – 79)
- DASH, F, ROM
- Independent observers



Significant correlation
 R = 0.4



significant correlation
 R = 0.2



Working status

- 117 re-employed
 - < 6m : DASH 20, > 6m DASH 33
 - P = 0.001
-
- Only blue collars
 - < 6m: DASH 15.5, > 6m DASH 33
 - P = 0.001

CONCLUSIE

- De pols is een belangrijk gewricht en behoud van enige mobiliteit is noodzakelijk
- "Work in progression"
- Klassiekers met toch vernieuwde procedures
- Arthroscopie is een duidelijke meerwaarde
- Toename van het spectrum van pathologieën