Predicting Failure and Complications in Total Wrist Arthroplasty; Review of a 40-year Experience

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Introduction

There has been controversy surrounding the use of total wrist arthroplasty (TWA) to treat wrist arthritis. Due to the high rates of complications, such as dislocations and distal implant loosening, as well as high rates of the need for salvage revision operations, many surgeons have abandoned the use of TWA in their practice. With the recent push to improve the TWA prosthesis design surgical techniques, and patient selection, their remains a need for a critical evaluation of factors that have contributed to the high rates of implant failure and complications.

Purpose

The objective of this study was to assess the results of our institution's 40 years of experience with primary total wrist arthroplasty, identifying factors associated with failures and complications.

Method

Analysis of 425 total wrist arthroplasties over a 40-year period performed at our institution from 1974 to 2013.

- Age at surgery = 57 years
- BMI = 2 7 kg /m^2
- Average OR time = 185 minutes

Surgical diagnoses:

- Osteoarthritis (OA): 22 (5%),
- Inflammatory arthritis: 375 (88%)
- Post-traumatic arthritis (PTA): 86 (7%)

Eight patients had a h/o traumatic wrist instability.

Implants utilized included Remotion (n=31), Biax (n=159), Volz (n=33), Meuli (n=138), Universal (n=7), and Swanson (n=57).

Cement was used in 357 (84%), while 36 (8%) required augmentation with bone graft.

Implant Survival Overall

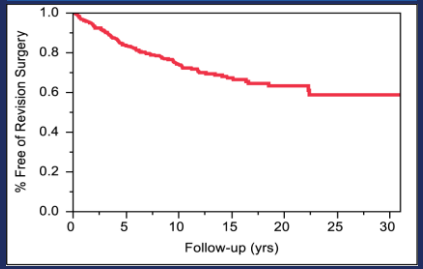

Figure 1. The 5, 10 and 20-year survival rates were 84%, 74%, and 63%, respectively.

Implant Survival by Surgical Indication

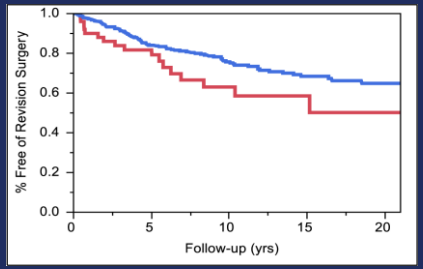

Figure 2. The 10-year survival rates for the inflammatory arthritis (blue) and OA or PT (red) were 76% and 63% (p=0.06), respectively. (p=0.06)

Revision Surgeries

At a mean follow-up of 11 years (2-35), there were 110 (26%) revision surgeries performed at a mean 5.3 years postoperatively; with an additional 37 reoperations.

Etiologies contributing to revision surgery include:

- Implant loosening (n=45)
- Component fracture (n=11)
- Infection (n=9)
- Wrist instability (n=31)
- Other (n=26)

Complications

There were 9 (2%) intraoperative complications involving a periprosthetic fracture.

Postoperative complications included:

- Implant loosening (n=51)
- Dislocations (n=46)
- Recurrent subluxation (n=21)
- Heterotopic ossification (n=7)
- Deep infection (n=12)
- Tendon/ligament injury (n=18)
- Wear (n=17)

Implant Loosening/Dislocation

Of the 51 components with loosening, 46 had distal implant loosening.

Dislocation rates were higher in the Meuli implants (p=0.03), while lower with the Swanson (p<0.01), and Remotion (p=0.01).

Loosening rates were higher in older patients (p<0.05), and those receiving the Biax implant (p<0.01), but were lower in the Swanson and Remotion implants (p<0.02).

Hazard Ratios for Risk of Revision Surgery

Risk Factor	Hazard Ratio	Confidence Interval	P-Value
Age at Surgery	0.99	0.98 - 1.01	p = 0.43
BMI	1.01	0.99 – 1.02	p = 0.24
Female	0.99	0.66 – 1.54	p = 0.97
Osteoarthritis	1.65	0.69 – 3.30	p = 0.24
Inflammatory Arthritis	0.63	0.39 – 1.10	p = 0.10
Post-traumatic Arthitis	1.46	0.72 – 2.67	p = 0.28
Tourniquet Time	1.00	0.99 – 1.01	p = 0.79
Operative Time	1.00	1.00 – 1.01	p = 0.21
Preop Instability	1.87	0.31 – 5.93	p = 0.43
Remotion	1.84	0.77 – 3.75	p = 0.16
Biax	0.78	0.52 – 1.16	p = 0.22
Volz	0.51	0.16 – 1.21	p = 0.14
Meuli	**1.50**	**1.02 – 2.18**	***p = 0.04**
Universal	2.90	0.71 – 7.76	p = 0.12
Swanson	0.66	0.35 – 1.14	p = 0.14
Prior ORIF	>10	13.19 – 13.19	p = 0.58
Bone Graft	1.68	0.88 – 2.94	p = 0.11
Cemented Implant	0.77	0.47 – 1.34	p = 0.34

Conclusions

This large series of total wrist arthroplasties performed over a 40 year period demonstrate relatively poor long-term implant survival:

- 10-year implant survival rate: 74%
- 20-year implant survival rate: 63%

Improved Implant Survival: Inflammatory arthritis
Worse Implant Survival: Meuli and Universal implants

Lower Complications: Swanson and Remotion implants
Higher Complications: Meuli and Biax implants