The role of implant arthroplasty in the management of the painful distal radio-ulnar joint

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A dysfunctional distal radioulnar joint (DRUJ) can significantly impair the ability of the wrist and hand to bear load and function effectively. The DRUJ is anatomically and kinematically a complex area of the body; pathology is rarely confined to one area. Problems with the DRUJ present frequently to orthopaedic clinics but are often poorly understood and difficult to treat effectively. This brief review considers the current place of arthroplasty in the treatment of DRUJ pathology.

Hip and knee arthroplasty has transformed the lives of countless patients around the world. Replacements are available now for almost every joint in the body and the DRUJ is no exception. Historically, simple resection of all, or part, of the ulnar head was favoured, for instance the Darrach procedure. Sometimes this was combined with fusion of a distal portion of the ulnar head to the adjacent radius to longitudinally support the carpus - the Sauve-Kapandji procedure. None of these procedures restored the normal transverse load bearing characteristics of the wrist. Patients, who loaded their wrists to any extent, after these procedures, were at risk of painful impingement of the ulnar stump against the distal radius, which significantly impairs wrist function (Figure 1a & b).

Over time our understanding of the anatomy and pathology of the ulnar side of the wrist has also developed. A recent review highlighted four key areas to consider when a patient presents with pain around the ulnar head:

1. Bony deformity – for instance following a previous distal radius fracture
2. Cartilage defects – arthrosis
3. Triangular-fibro-cartilage-complex (TFCC) injuries – the primary static stabiliser of the DRUJ
4. Extensor carpi ulnaris tendon instability – the primary dynamic stabiliser of the DRUJ.

In each patient, the contributions from these four areas should be considered, and addressed, in order to optimise the outcome.

Only 20% of DRUJ stability is bony, the other 80% derives from the surrounding soft tissues. With ulnar head arthroplasty the 80% soft tissue stability is provided by preservation, repair, reconstruction or replacement depending on the type of implant employed.
Indications for DRUJ arthroplasty

The indications for DRUJ arthroplasty are primary and secondary. Primary indications are primary and post-traumatic osteoarthritis (OA) and rheumatoid arthritis (RA) with its associated destruction of the distal ulna and DRUJ, in the higher demand patient. Secondary indications include marked symptoms following ablative distal ulnar surgery, such as after a Darrach’s or Sauve-Kapandji procedure.

Types of arthroplasty

Ulnar head replacement began with Swanson’s silicone prosthesis. This was abandoned in the 1990s as a result of poor results, with loosening and bone resorption. The first solid hemiarthroplasties of the ulnar head were implanted in 1995. Partial ulnar head replacements have been developed more recently. These aim to retain the ulnar styloid and its soft tissue attachments. The latest design has been a total joint replacement that replaces the sigmoid notch of the distal ulna as well as the ulnar head.

Solid ulnar head arthroplasty

Solid ulnar head arthroplasties (Figure 2) were initially implanted solely following failed ulnar head resection. A prospective, international, multi-centre study group was set up at the start of this process. This group consisted of workers in Germany, Switzerland, the USA and Australia. Von Schoonhaven⁶,⁷ has reported the early and later results of this cohort of 23 patients who had a mean age of 45 years at the time of implantation. Sixteen patients remained for review at a mean of 11 years post-implantation. The good early results had been maintained with a mean pain score of 1.7/10, mean patient satisfaction of 8.9/10, grip strength of 81% of the contralateral hand and no radiographic signs of progressive loosening. These results are attractive, but only relate to a very small cohort of patients.

The indications for ulnar head hemiarthroplasty quickly expanded to include patients with arthritis of all types, including abutment of a long ulnar against the ulnar side of the carpus. A recent unpublished systematic review looked at all published results on ulnar head hemiarthroplasties (Moulton LS and Giddins GEB). The study used PRISMA guidelines to review the literature. Only 14 studies with 355 implants were identified. Not all implants were of the original design reported by von Schoonhaven’s group and a more varied set of indications for surgery were included. The overall survival for the whole group, at a mean of 45 months, was 92.5%.

A careful soft tissue repair is necessary following ulnar head arthroplasty. Partial ulnar head replacements have also been developed (Figure 3) with the aim of preserving the ulnar styloid and TFCC intact, thus limiting the surgical soft tissue reconstruction. Published results for partial arthroplasty are very limited. The 11 months results for three patients were published in 2007 for the Eclypse pyrocarbon model⁸. A further five cases in patients with RA were reported with a mean follow up of 64 months in 2016⁹; only four cases were reviewed. The mean pain score was 1.5 with a mean grip strength of 148% of the other side. Two cases were presented using the Integra partial resurfacing design with only one year of follow up¹⁰.

Complications described for ulnar head arthroplasty include residual instability of the distal ulna, infection, implant loosening, bone resorption, tendon rupture and implant failure.

Total DRUJ replacement

In 2005 Luis Schecker, of the Kleinert Institute in Louisville, began implanting the Aptis total DRUJ prosthesis (Figures 4 and 5). This replaced the ulnar head and the adjacent sigmoid notch of the radius and has a constrained construct. This prosthesis is indicated if the sigmoid notch has been significantly damaged, or worn, along with the ulnar head and/or if the surrounding soft tissues are poor. Schecker published his preliminary results in 2014¹¹. This study consisted of

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Further reports of this prosthesis were reviewed in the systematic review mentioned earlier. They identified a total of 15 studies with 319 implants. All prostheses reported were the Aptis design, or a prototype thereof. A range of indications for surgery were described. The overall survival for the whole group, at a mean of 44 months of follow up, was 97%.

Complications for the total DRUJ replacement include infection, heterotopic bone formation, tendonitis, bone resorption, implant fracture, screw irritation and loosening.

Conclusions

Around the world many, if not most, hand units include some form of ulnar head replacement in their armamentarium. When faced with a summary of the actual evidence on which we are using these implants, however, it is difficult not to feel uncomfortable. The published data describes a very small number of patients, with only short-term follow up in most cases. Most of the published reports are from the implant designers themselves or established experts in this field. One is left feeling, not for the first time, that routine, prospective collection of data regarding ‘new’ implants should be common place in this age when connectivity is so easy. In the future this will surely be the way all implant development and implementation will take place.

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References

References can be found online at www.boa.ac.uk/publications/JTO or by scanning the QR Code.
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