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Original article

Complications of Scheker semiconstrained distal radioulnar joint arthroplasty in a low-volume unit

Complications de l'arthroplastie semi-contrainte de l'articulation radio-ulnaire distale de Scheker dans une unité de faible volume

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ABSTRACT

Semiconstrained arthroplasty of the distal radioulnar joint (DRUJ) (Scheker prosthesis, Aptis Medical, Glenview, KY, USA) is a treatment option in case of irreparable destruction of the DRUJ. In our unit, a Scheker endoprosthesis was implanted in 5 wrists in 4 patients. 3/5 wrists (60%) in 3/4 patients (75%) underwent revision surgery. Reasons for revision surgery were implant loosening, periprosthetic fracture of the radius and suspicion of periprosthetic infection. Asymptomatic loosening of the screw of the radial head cover was detected in one wrist. Scheker arthroplasty is technically demanding. The prosthesis is prone to failure over the long term. Before implantation, all patients should be informed of the high risk of revision surgery.

RÉSUMÉ

L'arthroplastie semi-contrainte de l'articulation radio-ulnaire distale (RUD) (prothèse de Scheker, Aptis Medical™, Glenview, KY, USA) est une option de traitement en cas de destruction irréparable de la RUD. Dans notre unité, une prothèse de Scheker a été implantée dans 5 poignets chez 4 patients. Trois poignets sur cinq (60%) chez trois patients sur quatre (75%) ont subi une chirurgie de reprise. Les raisons de la chirurgie de reprise étaient le descellement de l'implant, une fracture périprothétique du radius et la suspicion d'infection périprothétique. Un démontage asymptomatique de la vis du couvercle radial a été détecté dans un poignet. L'arthroplastie de Scheker est techniquement exigeante. La prothèse est sujette à l'échec à long terme. Avant l'implantation, tous les patients doivent être informés du risque élevé de chirurgie de reprise.

1. Introduction

Distal radioulnar joint (DRUJ) destruction is usually caused by trauma, rheumatoid arthritis, osteoarthritis, or tumor. In the last decade, joint replacement emerged as an option for the traditional Darrach or Sauvé-Kapandji salvage procedures [1]. The initial data published by the originators of the Scheker prosthesis (Aptis Medical™, Glenview, KY, USA) – a semiconstrained DRUJ arthroplasty – showed good implant survival and improvement in functional outcome [2,3]. More recently, higher complication rates, with around 1/5 to 1/3 patients undergoing reoperation, were reported from high-volume units [4–7]. In a small case series, four out of nine patients underwent implant revision/removal [8]. Possible complications include periprosthetic fracture, radial plate or ulnar stem loosening, infection, tendon irritation or rupture, heterotopic ossification, and neuroma. The aim of this report was to determine the rate and type of complications in a unit with a low volume of Scheker prosthesis implantation.

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2. Patients and methods

Between 2010 and 2019, 5 wrists in 4 patients were implanted with a Scheker prosthesis in our hospital. All procedures were performed between October 2014 and April 2017 by an experienced level III orthopedic or hand surgeon [9]. Intraoperative fluoroscopy was used to determine the correct placement of the implant. Permission for the use of patient data was received from the hospital management (license number T01/012/21). The age range of the patients was 51-62 years. The reason for implantation was primary osteoarthritis in two cases, one case of posttraumatic joint destruction and one case of seronegative rheumatoid arthritis. Pre- and post-operative grip strength was measured using a Jamar® dynamometer.

3. Case reports

3.1. Patient 1

A 62-year-old male sought treatment for DRUJ osteoarthritis due to open fracture of the forearm in the non-dominant left wrist sustained 2 years previously. The patient was a heavy smoker. The primary injury had been treated with a volar plate for the radius and K-wires and tension band for the ulna. The DRUJ was deemed stable, with active pronation-supination of 65° to 10°. The patient had 30° active wrist flexion and equal extension. In addition to painful DRUJ osteoarthritis, the patient had developed extensor tendon tear in the 4th and 5th fingers. He underwent plate and wire removal, Scheker endoprosthesis implantation, and simultaneous extensor tendon reconstruction (Fig. 1A). Two months later, he experienced a snapping sensation when lifting a chair. X-ray revealed periprosthetic fracture of the radius (Fig. 1B). The patient underwent fracture treatment with a volar plate. Thereafter, recovery was uneventful. Postoperative range of motion was 55°, 70°, 35° and 30° active wrist pronation, supination, extension, and flexion, respectively. Wrist X-ray taken 1.5 months after fracture fixation showed union (Fig. 1C). The patient has remained as an outpatient in our institution for 4 years after implantation at the time of writing, with no further revision procedures.

3.2. Patient 2

A 56-year-old male blue-collar worker sought treatment for bilateral DRUJ osteoarthritis. After 9 years' conservative treatment with NSAIDs, a decision for joint replacement was made. Active pronation of the left and right wrists was 80° and 80° and supination 90° and 85°, respectively. The patient showed bilateral unstable DRUJ with dorsal subluxation of the ulna in pronation. He underwent bilateral DRUJ endoprosthesis implantation at a 9-month interval (Fig. 2). Postoperative grip strength in the left and right wrist was 49 kg and 54 kg, pronation 65° and 65° and supination 25° and 85°, respectively. After the procedure, the patient quit heavy manual work and applied for retraining. Four years after implantation, he started experiencing a snapping sensation in the right wrist combined with rugged bumpy motion of the DRUJ. Revision of the right wrist revealed breakage of the radial plate fixation screws and loosening of the radial component. The radial plate was replaced. At a control 5 years after initial implantation, grip strength was 44 kg and 45 kg in the left and right hand, respectively. No complications were detected on X-ray at that stage.

3.3. Patient 3

A 51-year-old male suffering from multiple joint destruction, treated 1 year 4 months previously by total wrist fusion of the dominant right hand and Darrach resection of the distal ulna, underwent Scheker endoprosthesis implantation. Grip strength was 24 kg and 44 kg preoperatively and 24 kg and 31 kg postoperatively in the left and right hand, respectively. Protruding screws of the radial component caused pain (Fig. 3A). The screws were cut in a reoperation via a radial approach using a cebotome 2 months after the initial surgery (Fig. 3B). Two years after surgery, the patient underwent 2 aspirations and 1 open incisional biopsy and irrigation of the DRUJ prosthesis for suspected infection, but no bacterial growth was detected. No loosening of the prosthesis was

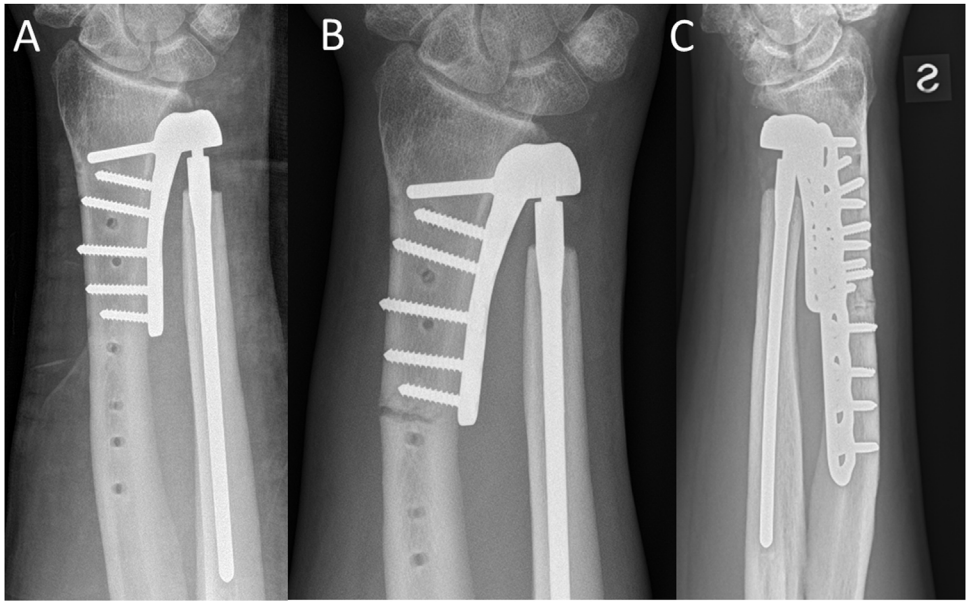

Fig. 1. Postoperative PA wrist X-ray in patient 1 (A). Periprosthetic fracture of the radius after plate removal and endoprosthesis implantation (B). Osteosynthesis of the periprosthetic fracture (C).

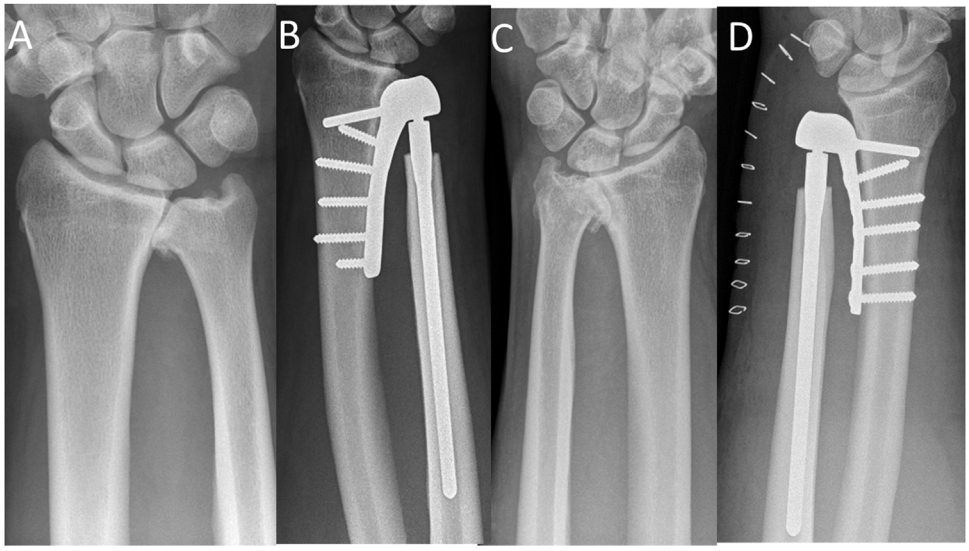

Fig. 2. Patient 2. Preoperative PA X-ray of the left wrist (A). Postoperative PA X-ray of the left wrist (B). Preoperative PA X-ray of the right wrist (C). Postoperative PA X-ray of the right wrist (D).

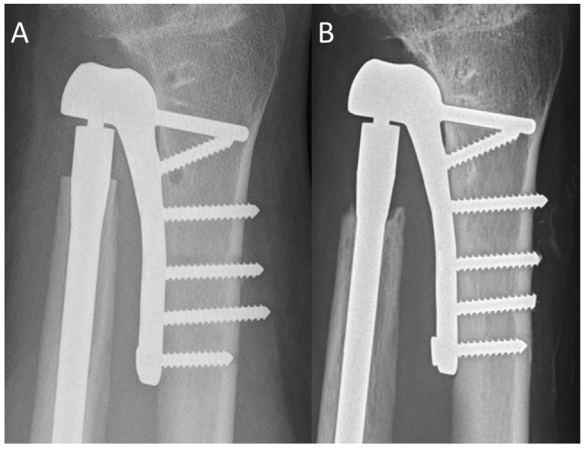

Fig. 3. Postoperative X-ray in patient 3 shows protruding screws of the radial component (A). The protruding screws were cut using a cebotome (B).

detected and there were no further revision procedures. The patient was last seen by a hand surgeon 7 years after endoprosthesis implantation.

3.4. Patient 4

A 56-year-old male had suffered from seronegative rheumatoid arthritis for 19 years. The patient hand undergone a multitude of surgeries of the upper and lower extremities, including partial wrist arthrodesis and Darrach resection of the dominant right wrist. Eight months after total wrist fusion and Darrach distal ulna resection of the non-dominant left wrist, the ulna remained unstable with persistent painful snapping. Grip strength in the left and right hand was 27 kg and 44 kg, respectively. The left forearm had 75° supination and 90° pronation. The patient underwent implantation of a Scheker endoprosthesis in the left wrist and simultaneous removal of the wrist fusion plate (Fig. 4A). Postoperative supination and pronation in the operated forearm were 75° and 80°, respectively. Postoperative grip strength was 30 kg and

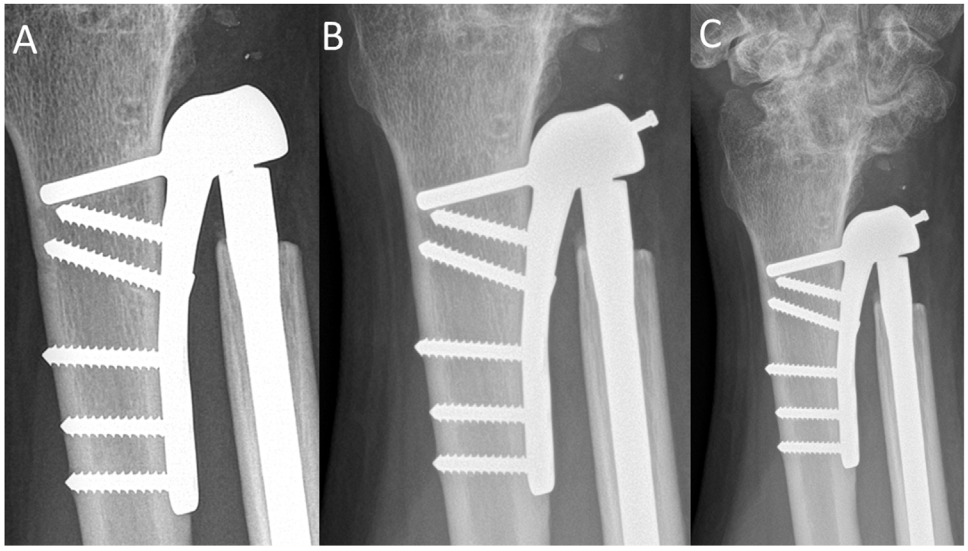

Fig. 4. Postoperative X-ray in patient 4 (A). Asymptomatic loosening of the radial cover locking screw seen on X-ray at 3 years (B). A follow-up X-ray taken four months after X-ray B showed no progression in the loosening of the radial cover (C).

44 kg in the left and right wrist, respectively. Three years after the procedure, follow-up wrist X-ray showed asymptomatic loosening of a screw of the radial plate cover (Fig. 4B). The patient remained asymptomatic and no revision surgery of the endoprosthesis was performed. Four years after endoprosthesis implantation, the patient underwent tendon transposition for closed tear of the extensor pollicis longus tendon, which was deemed unrelated to the endoprosthesis. X-ray of the left wrist 4 months after screw loosening was first detected did not show any progression and the radial plate cover was still intact (Fig. 4C). The patient was last seen by a consultant orthopedic surgeon for a general status checkup – which did not include wrist X-ray – 7 years after the procedure.

To sum up, Scheker prostheses were implanted in 5 wrists in 4 patients. Three out of five wrists (60%) and three out of four patients (75%) underwent revision surgery.

4. Discussion

The rate of complications was even higher than previously reported in large series from single expert centers [3–6]. Three out of 4 patients experienced a reoperation and the remaining patient experienced asymptomatic loosening of the screw of the radial plate cover. The complications were related to operative technique (protruding radial screws), to the endoprosthesis itself (breakage) or to patient-related factors (periprosthetic fracture), without any single cause. In our health system, wrist endoprosthesis implantation is allocated to major centers (university hospitals). Even so, the volume of Scheker endoprosthesis implantation in our unit was very low, which can be attributed to the high cost of the implant. Scheker endoprosthesis implantation is technically demanding and requires a meticulous operative technique, which may be difficult to achieve when the volume of implantation is low. At least one reoperation (due to protruding screws) was clearly related to deficient surgical technique. The position of the radial plate screws makes protruding screws prone to cause soft tissue irritation, necessitating reoperation [10]. We found cutting the protruding screws to be an option, so that screw removal was not needed.

Implant breakage also occurred, and this may in some cases be an unavoidable complication. Radial head cover screw loosening is likewise a risk. In our case, the implant in question was of the older type, with two small radial head cover screws. We detected radiological loosening of one of the small screws. This raised concerns as to whether the remaining screw would adequately hold the radial head cover in place or if further loosening or radial head cover breakage would occur. In the new model of the Scheker implant, the two small radial head cover screws have been replaced by one longer screw. We do not yet have long enough experience to know whether this new model will reduce the risk of loosening of the screw of the radial head cover.

We experienced one case of refracture of the radius requiring plate fixation after the patient underwent simultaneous plate removal and endoprosthesis implantation. This is a frequent scenario, since the Scheker prosthesis is frequently implanted in patients that have previously undergone wrist fusion or surgery for distal radius fracture with the plates still present. If technically feasible, the plate may be left in place during implantation. Another option is to remove the plate and let the screw holes heal before endoprosthesis implantation. Periprosthetic fracture is infrequent, but currently it is not clear how often it is related to simultaneous hardware removal [4,6].

The limitations of this report are its retrospective design, lack of predetermined follow-up and small number of patients. Patient-rated outcome measures (PROMs) were not recorded, and grip strength and range of motion data were missing in some cases. Because of the limited literature regarding the outcome of semiconstrained Scheker prosthesis arthroplasty, the author recommends multicenter retrospective trials or endoprosthesis registry studies, in order to determine the rate of complications in low-volume units.

In conclusion, Scheker endoprosthesis implantation is demanding. It requires meticulous surgical planning and operative technique. Before implantation, all patients should be advised that revision procedures are frequently required.

Conflicts of interest

The author has no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Review board approval

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Informed consent declaration

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