Orthopaedics & Traumatology: Surgery & Research 101 (2015) 969–971

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Elsevier Masson France
EM|consulte
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Technical note

Unicompartmental isoelastic resurfacing prosthesis for malignant tumor of the distal radius: A case report with a 3-year follow-up

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ARTICLE INFO

Article history:
Received 24 May 2015
Accepted 16 September 2015

Keywords:
Unicompartmental isoelastic resurfacing prosthesis
Hemiprosthesis
Malignant tumor
Distal radius

ABSTRACT

We report a case of 74-year-old man in whom a unicompartmental isoelastic resurfacing prosthesis was used to reconstruct the distal radius after en-bloc resection of a malignant tumor. Thirty-nine months after the operation, on a visual analogic scale, pain score was 0/10 and range of motion was 25° of flexion, 5° of extension, 70° of pronation, 45° of supination, 20° of radial deviation, and 30° of ulnar deviation. The Quick DASH functional score was 72.72/100. With radiographic finding, the prosthesis was well-aligned, with no evidence of loosening but with slightly implant conflict with the lunate. This case report indicates that unicompartmental isoelastic resurfacing prosthesis seems a simple and reliable technique for distal radius reconstruction after en-bloc resection of malignant tumor.

1. Introduction

The distal radius is a relatively common site for primary bone tumors [1]. En-bloc resection of the distal radius is indicated for malignant lesions or aggressive benign lesions [2]. In a few decades, primary en-bloc tumor resection has been advocated, as lower recurrence rates have been reported with this technique [3,4]. The various procedures described for distal radius reconstruction after en-bloc resection include allograft, autologous vascularized fibular graft, non-prosthetic radiocarpal or mid-carpal arthroplasty, partial or total wrist arthrodesis, and distal ulnar translocation [5–9]. However, none of these reconstruction techniques have acquired satisfactory results. Recently, Hariri et al. described about the advantage of total custom made (TCM) prosthesis for distal radius reconstruction after en-bloc resection in patients with recurrent giant cell tumor [10].

We report here a unicompartmental isoelastic resurfacing prosthesis of distal radius reconstruction after en-bloc resection of malignant tumor. This technique seems to be simple, cost-effective, and reliable compared to others.

2. Case report

A 74-year-old right-handed man in whom had been diagnosed left renal adenocarcinoma and treated by left nephrectomy at another hospital. He was also diagnosed as a tumor metastasis to the distal radius 16 months after primary diagnosis (Fig. 1).

At the time of reference to outpatient, on a visual analogic scale, pain score was 2/10. The Quick DASH functional score of upper limb was 22.73/100. In order to avoid a risk of fracture and improve upper limb function, surgery was performed via the dorsal approach under locoregional anesthesia as an outpatient procedure. We performed en-bloc resection of the tumor by removing 12 cm of the distal radius (Fig. 2). A unicompartmental isoelastic resurfacing prosthesis (Prosthelast®, Argomédical™, Cham, Switzerland) was used for the reconstruction to fulfil the defect of distal radius. The stem (a 2.5-mm diameter Kirschner wire) was introduced retrograde into the radial medullary canal and inserted up to the subchondral bone of the radial head using fluoroscopy. A trial implant was applied to determine the optimal length (ulnar variance = 0). The trial was removed, and the definitive implant was fixed with the intramedullary stem using an attachment screw and secured with acrylic cement (Palacos® gentamicin, Heraeus Kulzer™, Hanau, Germany) (Fig. 3). The head of the ulna did not impinge on the prosthesis intraoperatively and was therefore left in place (Fig. 4). Exam under fluoroscopy was performed at the wrist and elbow to confirm stability and motion. After wound closure in layers with no drainage, a forearm based palmar wrist splint with 30° of extension was applied for 2 weeks. The splint and sutures were removed on day 15 and self-rehabilitation was started with no forceful movements. The patient was re-evaluated at regular intervals.

At 14 months after the operation, on a visual analogic scale, pain score was 1/10. The Quick DASH functional score of upper limb was

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http://dx.doi.org/10.1016/j.otsr.2015.09.020
1877-0568/

Fig. 1. Preoperative X-ray findings (anteroposterior and lateral radiographs). The tumor widespread to the distal end of radius.

36.36/100. Motion ranges were 5° of flexion, 10° of extension, 45° of pronation, 15° of supination, 10° of radial deviation, and 0° of ulnar deviation (Video 1). Grip strength was 11 kg on the right and 31 kg on the left.

At last follow-up of 39 months after the operation, the general condition of the patient was getting worse, not due to the wrist but mainly due to multiple metastasis including femur fracture and brain. On a visual analogic scale, pain score was 0/10 with painkillers. The Quick DASH functional score of upper limb was 72.72/100 because of brain metastasis and communication issue. Motion ranges were 25° of flexion, 5° of extension, 70° of pronation, 45° of supination, 20° of radial deviation, and 30° of ulnar deviation. Grip strength was 2 kg on the right and 2 kg on the left.

With radiographic findings, the prosthesis was well-aligned, showed no signs of loosening, but proximal migration through the radial head without patient complain (lack of 20° of elbow extension). Ulnar side of prosthesis slightly conflicted with the lunate (Fig. 5).

3. Discussion

Few publications have described about total prosthetic reconstruction after en-bloc resection of the distal radius [11,12]. In the literature, some authors often use total custom made prosthesis [10,13].

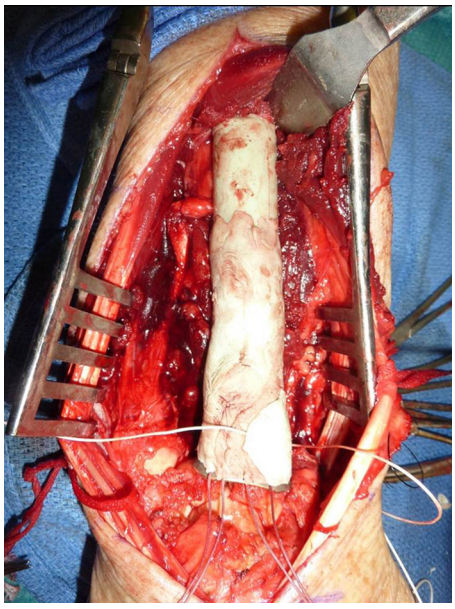

Fig. 3. Prosthelast® put in place and secured with acrylic cement.

However, there are some disadvantages of these total and custom-made prosthesis. Concerning the waiting period, because of the necessity of precise personal skeletal information, TCM need to wait for around 2 months before operation. Total wrist prosthesis has also often the risk of the carpal component loosening [14–16]. Concerning the cost-effectiveness, total custom made prosthesis take a high cost approximately 3000 €.

Recently, some authors have described about the use of unicompartmental prosthesis for wrist arthroplasty [17–21]. These authors also described that unicompartmental prosthesis has some advantages compared to TCM. The most important advantage is that there is no need for carpal component insertion. One author described that the isoelastic unicompartmental prosthesis (Prosthelast®) has more advantage than other unicompartmental prosthesis [14]. Prosthelast® seems able to maintain and adjust the length of radius with the use of intramedullary Kirchner wire after the en-bloc

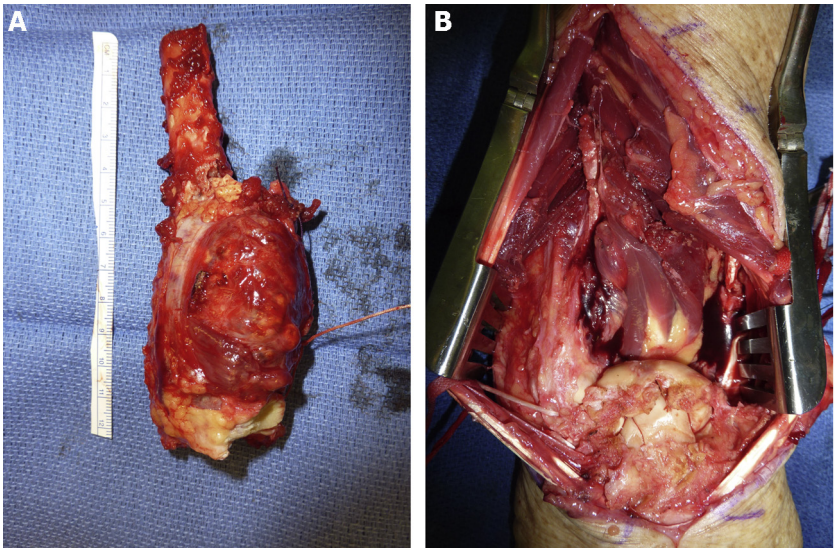

Fig. 2. Intraoperative findigs. A. En-bloc resection of specimen including 12 cm of distal radius. B. After en-bloc resection, there is a large bone defect of the distal radius.

Fig. 4. Postoperative X-ray findings. Anteroposterior view: note the absence of a radiolucent line around the prosthesis. Lateral view: there is no subluxation of the ulna head.

Fig. 5. X-ray findings at last follow-up. Anteroposterior view: note the implant proximal migration to the radial head. Oblique view: there is a subluxation of the ulna head.

resection of tumor. This makes it possible to fulfill the appropriate volume of cement to the defect. The use of intramedullary support would also provide reliable primary stabilization of the prosthesis. This ideal length of the intramedullary pin would probably restore an anatomical distal radio-ulnar variance.

In our case, we could not use other techniques such as amputation, reconstruction or arthrodesis with (non) vascularized bone graft. Because oncologists said that even if the prognosis was not so well, they never decide to do amputation for psychological reasons. Concerning the reconstruction or arthrodesis with vascularized fibula bone graft, there was the risk of non-union after radiotherapy. In addition, CTM was also not good option because if we waited a couple of weeks, according to the preoperative X-ray, patient probably suffered a wrist fracture.

From these technical advantages and general condition of patient, in this case, we used Prosthelast®. Prosthelast® is isoelastic unicompartmental prosthesis and enable to use immediately without waiting period. We can also easily modulate the shape of the reconstruction with the use of bone cement. Concerning the cost-effectiveness, Prosthelast® only take a 1000 €. The two drawbacks of Prosthelast® were the risk of proximal migration and DRUJ dislocation. In case of these complications, because of patient critical condition, an amputation would have been the solution. But the patient had a good result up to multiple metastases.

In conclusion, Prosthelast® with bone cement is a good solution for distal radius malignant tumor.

Disclosure of interest

Philippe Liverneaux has conflicts of interest with Newclip Technics, Integra, Argomedical, iiN medical. The other authors declare that they have no competing interest.

Fundings

None.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.otsr.2015.09.020.

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