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Original article

Complete ring finger avulsion: Review of 16 years of cases at a Hand Emergency Unit

Avulsion digitale complète par bague, ring finger *type IV : retour sur 16 ans d'expérience d'un centre SOS mains*

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ABSTRACT

Replanting complete ring avulsion injuries remains a challenge for hand surgeons. The prognosis depends on achieving satisfactory function. We present the results of our 16 years' experience with managing this type of injury. Our cohort consisted of 83 cases of complete ring avulsion injuries in patients with an average age of 23.5 years, treated in a Hand Emergency Unit between 1998 and 2014. Seventy-two were replanted. A vein graft was used in 57 cases to bridge the arterial injury and direct anastomosis was performed in 15 cases. Forty-one cases were a microsurgical success. Twenty-four patients were reviewed with an average follow-up of 87 months. The mean of total active motion was 164°, with 64° range of motion in the proximal interphalangeal joint on average. The two-point discrimination for sensitivity averaged 6 mm. Two cases of severe cold intolerance were noted. Using a graft for vascular repair increases the odds of microsurgical success. The functional outcome depends on the condition of the proximal interphalangeal joint. Cold intolerance and lack of sensitivity have little effect on the functional outcome and patient satisfaction. Replantation of complete digital avulsion injuries should be attempted. Amputation at the metacarpal base is better discussed later on, after the initial surgery.

Mots clés :
Avulsion digitale par bague
Replantation
Greffon veineux
Amputation

RÉSUMÉ

La replantation des avulsions digitales complètes par bague reste un challenge pour les chirurgiens de la main. Le pronostic est conditionné par un résultat fonctionnel satisfaisant. Nous rapportons les résultats de notre expérience dans la prise en charge de ce type de lésion. Notre série comportait 83 cas d'avulsion digitale complète par bague chez des patients d'un âge moyen de 23,5 ans, prise en charge dans un service d'urgences mains entre 1998 et 2014. Soixante-douze ont été replantés. La réparation vasculaire a utilisé un greffon veineux dans 57 cas, une anastomose directe a été réalisée dans 15 cas. Quarante et un cas ont été un succès microchirurgical. Vingt-quatre patients ont été revus avec un recul moyen de 87 mois. L'arc de mobilité actif moyen était de 164°, avec un arc de mobilité globale de l'interphalangienne proximale d'une moyenne de 64°. Le test sensitif de discrimination des deux points avait une moyenne de 6 mm. Deux cas d'intolérance sévère au froid ont été notés. L'utilisation de greffon dans la réparation vasculaire augmente le taux de succès microchirurgical. Le résultat fonctionnel dépendrait de l'état de l'interphalangienne proximale. L'intolérance au froid et le manque de sensibilité influencerait peu le résultat fonctionnel et la satisfaction du patient. La replantation des

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avulsions digitales complètes par bague doit être tentée. L'amputation en base de métacarpien sera mieux discutée à distance de la prise en charge initiale.

1. Introduction

Replantation of a complete ring finger avulsion has been debated and long considered a flawed treatment choice due to poor functional results [1–4]. Indeed, finger avulsions caused by a ring are severe on both the macroscopic [5] and microscopic levels [6], thus represent a real reconstruction challenge for hand surgeons. Existing classification systems [1,7–10] specify which elements condition the functional prognosis and allow the indications for replantation to be expanded. The Urbaniak et al. [1] and Nissenbaum [10] classification systems divide the lesions by the vascular injury. Other classifications, which were mainly aimed the complete avulsions, include the amputation level: bone for Kay et al. [8] and Foucher [7], distal or proximal to the flexor digitorum superficialis (FDS) for Adani et al. [9].

The objectives of our study were to present our team's extensive experience with managing complete ring finger avulsions, to review the results, to collect the literature data and to assess whether replantation is justified in this kind of avulsion.

2. Patients and methods

Our study pertains to patients treated in a Hand Emergency Unit between 1998 and 2014 for a complete ring finger avulsion. A total of 83 records were reviewed, with an average patient age of 23.5 years. Seventy-two fingers were replanted. To standardize the cohort, we excluded incomplete ring finger avulsions. We included class IV complete ring avulsions according to the Urbaniak classification revised by Kay et al. (Table 1) [8]. The patients' age, level of replantation, surgical technique, postoperative care and the occurrence of complications were extracted from their medical records. Analysis of the functional results took into account the range of motion (ROM) of the proximal interphalangeal (PIP) joint and the distal interphalangeal (DIP) joint and the total active motion (TAM). Sensibility results were evaluated by a Weber static 2-point discrimination test (2PD). Trophic and vasomotor disorders, such as cold intolerance, were also investigated. The impact of the replantation on daily and work activities was evaluated using the Quick Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire.

Table 1
Classification of ring finger injuries: Urbaniak revised by Kay et al. [8] and subdivision of the class IV injuries according to Adani et al. [9].

Class	Description
I	Circulation adequate with or without skeletal injury
II	Circulation inadequate, no skeletal injury
II A	Arterial circulation inadequate only
II B	Venous circulation inadequate only
III	Circulation inadequate with fracture or joint injury present
III A	Arterial circulation inadequate only
III B	Venous circulation inadequate only
IV	Complete Amputation
IVd	Amputation distal to the FDS insertion
IVp	Amputation proximal to the FDS insertion

FDS: flexor digitorum superficiali.

2.1. Surgical technique

The replantation technique, which varied depending on which hand surgeon performed the procedure, consisted of the following steps: debridement of damaged tissues, use of a tourniquet, surgical approach to the proper palmar digital artery using a hemi-Bruner incision at the DIP joint on the dominant vascular side under microscope, while avoiding any splitting of the sheath (Figs. 1–2). Repositioning of the amputated tissues was facilitated by using Vaseline; fixation was accomplished with minimal hardware using one or two K-wires. Bone shortening was not necessary in every case, but only made when direct vascular anastomosis was performed. The choice between direct anastomosis and use of a vein graft for arterial repair was made after microscopic examination of the artery, particularly when a proximal arterial thrombosis exceeded 1 cm. In 57 cases, the artery repair was performed using a vein graft from the base of the proximal phalanx, close to the common palmar digital artery bifurcation where the microscopic conditions are better, to the DIP joint. First, the distal anastomosis was done, then, subcutaneous passage of the venous graft and proximal anastomosis. Direct arterial anastomosis was performed in 15 cases. At least one vein was repaired during same session. Two veins were repaired in 20 cases. Heparin solution was used intraoperatively for cleaning of the blood vessels. Due to the consistent finding of significant

Fig. 1. Complete ring finger avulsion graded as class IV.

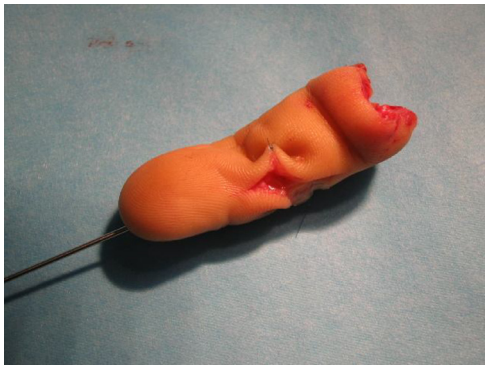

Fig. 2. Intraoperative preparation of the distal fragment with an approach to the collateral palmar digital artery at the distal interphalangeal joint.

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