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ORIGINAL ARTICLE

Enlargement of the flexor pulleys by an omega plasty: A study comparing the release of one or both sides of the A2 and/or A4 pulley

Agrandissement des poulies de l'appareil fléchisseur des doigts par plastie en oméga : étude comparant la désinsertion d'un ou de deux côtés de la poulie A2 et/ou A4

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Plasty;
Omega;
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Pulley

Summary
Purpose. — The omega plasty on one side of the A2 and/or A4 pulley improves the gliding of repaired flexor tendons in zone II. The purpose of this study was whether or not the enlargement of the digital channel was better after the release of one or both sides of each pulley.
Methods. — In fresh cadavers, the technique was to first disinsert the ulnar attachments of the A2 and A4 pulleys and then the radial insertions. An ultrasound was used to measure the large axis, the circumference, and the cross-sectional surface of each of A2 and A4 pulleys before release, after ulnar release and after radial release.
Results. — The release of the A2 pulley reduces the risk of conflict in the sutured flexor tendons in the digital channel. The release of the A4 pulley seems less effective than that of A2. The release of the two pulleys reduces the risk of conflict in one sutured zone of the flexor tendons in the digital channel.

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Conclusion. — In all, if there is a conflict between the flexor tendons sutured opposite A2, we recommend an omega plasty on the two sides of the pulley. If the conflict appears opposite A4, we recommend the plasty of the two sides of A4 and A2.

MOTS CLÉS
Plastie ;
Oméga ;
Tendon fléchisseur ;
Poulie

Résumé La plastie en oméga d'un côté de la poulie A2 et/ou A4 améliore le glissement des réparations des fléchisseurs en zone II. Le but de cette étude était de savoir si l'agrandissement du canal digital était meilleur par désinsertion d'un ou de deux côtés de chaque poulie. La technique consistait chez des cadavres frais à désinsérer d'abord l'insertion médiale des poulies A2 et A4, puis l'insertion latérale. Une échographe a permis de mesurer le grand axe, la circonférence, et la surface de section de chacune des poulies A2 et A4 avant désinsertion, après désinsertion médiale, après désinsertion latérale. La désinsertion de la poulie A2 diminue les risques de conflit de l'appareil fléchisseur suturé dans le canal digital. La désinsertion de la poulie A4 semble moins efficace que celle de A2. La désinsertion des 2 poulies diminue les risques de conflit d'une zone de suture de l'appareil fléchisseur dans le canal digital. Au total, lorsqu'apparaît un conflit entre appareil fléchisseur suturé en regard de A2, nous recommandons la plastie en oméga des 2 côtés de la poulie. Lorsque le conflit apparaît en regard de A4, nous recommandons la plastie des 2 côtés de A4 et de A2.

Introduction

When repairing flexor tendons lacerations in zone II, the closure of the sheath and pulleys reduces adhesions, restores synovial nutrition and improves tendon gliding [1]. When the closure is accompanied by the narrowing of the digital channel, causing a conflict between the sutured zone and the A2 and/or A4 pulley that disrupts the tendon gliding, some authors have proposed to practice a ulnar or radial, partial or total incision of the A2 and/or A4 pulleys [2]. Other proposed the enlargement plasties of the A2 and/or A4 pullies that have the advantage of preserving the continuity of pulleys thus allowing immediate mobilization [3,4].

Omega plasty consists in disinserting one side of the A2 and/or A4 pulley subperiosteally [4]. No information in literature has been found on how to quantify the expansion induced by an omega plasty. No secondary pulley rupture has been reported.

The primary judgment criteria of this study was whether the expansion induced by an omega plasty was better with release of one or both sides of the A2 and/or A4 pulley. The secondary judgment criteria was whether the enlargement of the pulley was better at A2 or A4.

Material and methods

Three forearms from fresh frozen cadavers were prepared in an experimental surgery laboratory.

As a first step and after excision of the entire palmar skin of the first two phalanges, the surgical technique was to subperiosteally release the entire ulnar attachments of the A2 and A4 pulleys with a blade. In a second step, we released the entire radial attachments of the A2 and A4 pulleys with a blade (Fig. 1).

Using a portable ultrasound with an HFL50x linear probe 15-6Mhz frequency (MTURBO®, SONOSITE™, Paris, France), the evaluation method consisted in measuring, the major axis, circumference, and cross-sectional surface of each of the A2 and A4 pulleys in three stages: before release, after ulnar release and after radial release. The hands were dipped one by one into the water in order to avoid direct contact between the ultrasound probe and the digital channel. This maneuver helped to avoid the compression of the digital pulleys (Fig. 2).

In order to measure the major axis, the two most distant points of the digital channel opposite the pulleys were seized by clicking the cursor on the screen of the system. The distance between the two points was then measured automatically.

In order to measure the circumference, a predefined ecliptic shape was superimposed on the major axis, and distorted to fit closer to the shape of the digital channel. The circumference of the ellipse was then measured automatically (Fig. 3).

The cross-sectional surface was automatically calculated from the surface of the ellipse.

The method of statistical analysis was to compare the means of three paired quantitative variables: major axis, circumference and cross-sectional surface of each of the pulleys at each step using a mixed linear regression model to which several random effects were added. The analyzes were performed under the Bayesian paradigm using MCMC methods. The results of the model fit were presented in the form of distributions. For each of the model parameters were calculated mean, standard deviation, median, quartiles and 95% credible intervals of the posterior distribution. We consider a parameter is non-zero when the 95% credibility interval was positive or negative. Prior distributions were considered low-informative. All models were adjusted with the WinBUGS software in its version 1.4.3.

Results

The results are shown in Tables 1 and 2.