SCIENTIFIC ARTICLE

Return to Usual Work Following an Ulnar Shortening Osteotomy: A Sample of 111 Patients

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Purpose The primary aim of this study was to analyze the median time until patients performed their usual work following an ulnar shortening osteotomy (USO). The secondary aim was to identify factors influencing the median time until return to their usual work.

Methods We used a retrospective cohort of patients with ongoing data collection from our institution in the Netherlands. Patients with paid employment who underwent USO were invited to complete a return-to-work questionnaire at 6 weeks, 3 months, 6 months, and 12 months after surgery. The probability of and median time until return to usual work were assessed using an inverted Kaplan-Meier analysis. Factors influencing the return to usual work were evaluated using multivariable Cox proportional hazard regression.

Results In total, 111 patients who underwent USO were included, with a mean age of 46 years. The probability of returning to usual work in the first year was 92%, and the median time was 12 weeks. The type of work was independently associated with a return to work, with median times of 8, 12, and 14 weeks for light, moderate, and heavy physical work, respectively. We did not find differences in return to usual work based on age, sex, duration of complaints until surgery, treatment side, smoking status, the preoperative Patient-Rated Wrist Evaluation score, or whether the osteotomy was performed freehand or with an external cutting device.

Conclusions Half of the patients that underwent USO fully performed their usual work by 12 weeks following surgery. We found that 92% of the patients performed their usual work within 1 year after surgery. We found a large variation in the time until a return to work based on the type of work. Surgeons can use this data to inform patients on the rehabilitation phase after USO. *(J Hand Surg Am. 2022;47(8):794.e1-e11.*

Type of study/level of evidence Prognostic IV.

Key words DRUJ, return to work, ulnar shortening osteotomy.

Online Exclusive

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ULNAR SHORTENING OSTEOTOMY (USO) is a common treatment for ulnar impaction syndrome.[1,2] Previous research on USO has predominantly focused on outcomes in terms of pain, function, and complications. Less information is available on whether and when patients can return to their usual work. For shared clinical decision-making, however, it is important that patients are counseled not only on the expected result of the treatment, but also about the time until return to work (RTW) following USO. Some studies reported on the time until patients returned to work following USO.[3–7] However, less is known about the prognostic factors for RTW.

For other types of hand surgery, several studies have investigated factors that are associated with RTW.[8–11] These studies reported that patient characteristics, such as sex, type of work, and pain before surgery, influence RTW in patients with hand disorders and injuries, but these factors may differ for different treatments and may therefore not generalize to USO.

Previous studies have shown that the time until RTW following trauma and upper extremity surgery is strongly influenced by whether the patients are receiving workers' compensation.[12,13] To compare the our RTW data with those of other societies, some details of the Dutch social welfare system are required. In the Netherlands, employees get paid leave in case of illness, following a law from June 5, 1913.[14] During the time this study was undertaken, the employer usually paid 100% of the full wages in the first year and 70% in the second year, and the wage cannot be lower than the minimum allowed wage as decided by the government. In addition, the employer is required to provide replacement activities and/or to do as much as possible to allow the employee to RTW within these 2 years or risk a fine (1 year of salary costs) on top of paying the 2 years of wages.

The primary aim of this study was to describe the probability of performing usual work within the first year following USO. The secondary aim was to identify factors influencing the median time until RTW.

MATERIALS AND METHODS

Study design and setting

This was a retrospective study on a cohort of patients that underwent USO between June 2011 and November 2020, using longitudinally gathered data from Xpert Clinics (The Netherlands). Within this period, our institution grew from 1 clinic with 2 hand surgeons to 18 clinics with 23 hand surgeons and over 150 hand therapists.

Patients visiting our institution are invited to participate in a routine outcome measurement system after their first consultation with a hand surgeon. If the patient agrees, they receive secure web-based questionnaires at intake and at 6 weeks, 3 months, 6 months, and 12 months after surgery using GemsTracker (Generic Medical Survey Tracker) electronic data capture tools.[15] GemsTracker is a secure, web-based application for the distribution of questionnaires and forms during clinical research and quality registration. For each round of questionnaires, patients are sent 3 reminders when they have not completed all questionnaires. The setting of our study group has been reported previously.[16]

We report this study using the Strengthening the Reporting of Observational Studies in Epidemiology statement.[17] The study was approved by the ethics committee of the Erasmus University Medical Centre. All patients provided informed written consent for their data to be anonymously used for this study.

Patients: We evaluated all patients in our database who had a treatment code of USO during the study period. Patients were excluded from this study when they: (1) were younger than 18 years; (2) did not have paid work before surgery; (3) underwent concomitant stabilizing procedures; or (4) did not provide information about RTW. Indications for USO were ulnar-sided wrist pain associated with ulnar impaction syndrome. Clinical symptoms included tenderness around the ulnar head with exacerbation during forceful grip, repetitive pronation, and a positive ulnocarpal stress test. Standard posterior-anterior wrist radiographs in a neutral wrist position were obtained to assess ulnar-positive variance. If ulnar-positive variance was not present or there was uncertainty regarding the diagnosis, posterior-anterior wrist radiographs with a firm grip, wrist arthroscopy, or magnetic resonance imaging were performed.[18] If a diagnostic wrist arthroscopy was performed, the triangular fibrocartilage complex, lunate, and triquetrum were evaluated according to the classification of Palmer.[19] Magnetic resonance images were assessed for focal abnormal signal intensity in the lunate, triquetrum, and ulnar head.[20]

Surgical procedure: The USOs were performed by 17 hand surgeons, who were all fellowship-trained and Federation of European Societies for Surgery of the Hand-certified, with experience levels 3 to 5 according to the classification of Tang and Giddins.[21]

Surgeons performed their preferred method of USO under general anesthesia or a regional anesthetic block (axillary or supraclavicular). A longitudinal incision was made on the ulnar surface of the forearm, and the ulna was exposed between the flexor carpi ulnaris and extensor carpi ulnaris. Care was taken not to damage the dorsal sensory branch of the ulnar nerve. An oblique osteotomy was made at the level of the distal diaphysis, and the ulna was shortened by several millimeters (median = 3 mm; interquartile range, 3−4 mm), depending on the preoperative ulnar-positive variance. The surgical technique evolved over the study period, with some surgeons choosing to perform the USO using various systems with precise osteotomy-guided jigs (63 Acumed, 1 Biomet, 2 Medartis, 4 KLS Martin) instead of a freehand technique (42).

Rehabilitation: The general postoperative immobilization protocol consisted of plaster cast immobilization (including the wrist and/or elbow) for 10 to 12 days (since 2015, this was reduced to 3−5 days), followed by a thermoplastic orthosis (including the wrist and, based on the surgeon's preference, also elbow immobilization) for 6 weeks after surgery, after which the orthosis was phased out within 6 weeks. Postoperative immobilization varied slightly based on the surgeons' preference and patients' needs. All patients were advised to follow an extensive rehabilitation program consisting of exercises under the direct supervision of a hand therapist: tendon-gliding exercises for the fingers were initiated immediately following surgery, wrist flexion/extension exercises were initiated 2 weeks after surgery, and pronation/supination and strengthening exercises were initiated after 6 weeks after surgery.

Standard radiographs were taken at 3 and 12 months after surgery to assess bony union, and additional radiographs were made on indication (eg, in cases of delayed union, nonunion, or trauma). Plate removal was considered when patients experienced irritation from the plate and when bone healing was confirmed with an x-ray.

The general instructions on physical activities and load bearing by the hand surgeons and hand therapists were to avoid pronation and supination in the first 5 to 6 weeks following surgery and to avoid forceful lifting in the first 7 to 13 weeks following surgery (Table E1, available online on the *Journal*'s website at www.jhandsurg.org). During daily practice, the hand surgeons' and hand therapists' instructions were tailored to the patient based on radiographic signs and the patient's symptoms. In the Netherlands, instructions on RTW and the type of work that can be performed are the sole responsibility of independent occupational physicians.

Variables, data sources/measurements

Baseline characteristics of all patients, including age, sex, occupational status, smoking status at the time of surgery, the duration of complaints, and hand dominance, were collected before initiating treatment. To assess patient-reported pain and hand functions at intake, the validated Dutch version of the Patient-Rated Wrist Hand Evaluation was used.[22] Pain during physical load was measured at baseline and at 6 weeks, 3 months, 6 months, and 12 months after surgery using a Visual Analog Scale (0−100, where higher scores indicate more pain).[23] Three levels of the physical intensity of work were defined: light physical work (eg, an office job), moderate physical work (eg, working in a shop), and heavy physical work (eg, working at a construction site). This information was recorded by a hand therapist after the diagnosis was made during the consultation.

Patients with paid employment were invited to complete an online questionnaire on RTW at 6 weeks and at 3, 6, and 12 months after treatment. Patients were asked whether they returned to work and were given the following answer options: (1) yes; (2) no, because of the hand/wrist problem I am currently being treated for; and (3) no, because of something else. If they answered "yes," patients were asked the following 5 questions (translated from Dutch): (1) how many hours per week do you usually work?; (2) how many hours per week are you currently working?; (3) how many weeks after your initial surgery did you return to your work?; (4) are you currently doing your regular work or are (temporary) adjustments made to your work?; and (5) how many weeks after starting your initial surgery did you return to your original work? If patients answered "no" to the initial question (option 2 and 3), no further questions were asked.

Return to work was defined as the first time that the patient reported having returned to work and performing the usual work for a minimum of 50% of the usual hours a week as stated in the patient's contract. Patients performing adjusted work were classified as not having returned to work. We chose 50% RTW as our primary outcome since Dutch labor laws require patients to be able to perform less than 50% of their usual work to be allowed any form of compensation.

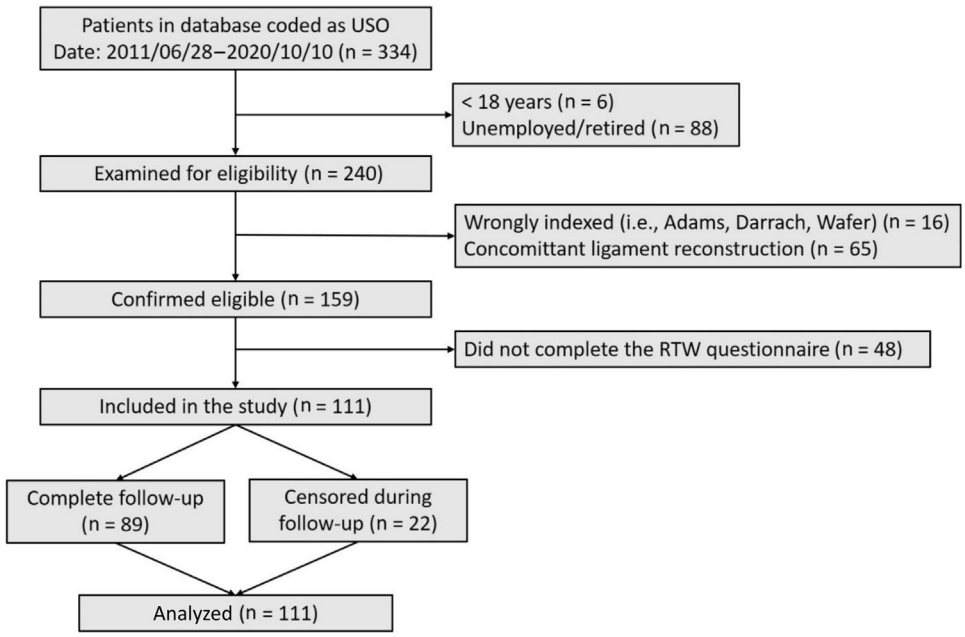

FIGURE 1: Flowchart of the study. TFCC, triangular fibrocartilage complex.

Statistical methods

We used the inverted Kaplan-Meier method to estimate the cumulative RTW during the first year following surgery and to calculate the median time until RTW. We conducted a complete-case multivariable Cox proportional hazards model to identify characteristics that were independently associated with RTW. A hazard ratio (HR) > 1 was interpreted as an increased probability to RTW, whereas an HR < 1 indicated a decreased probability to RTW. We made sure not to exceed the advised minimum of 10 events per included predictor variable.[24,25] We tested the proportional hazards assumption using Schoenfeld residuals. In all time-to-event analyses, we addressed loss to follow-up by censoring patients who reached retirement during follow-up or stopped providing information regarding RTW. This means that patients were included in the analysis for the time that they provided data, thus dealing with losses to follow-up and minimizing bias.[26] The weeks in which participants were censored are marked with a "+" in the Kaplan-Meier curve. The Visual Analog Scale was analyzed using a linear mixed model with random intercepts.

For all tests, we considered a P value equal to or smaller than .05 to be statistically significant. Because data were collected during daily clinical practice, we had a substantial proportion of nonresponses at follow-up (Fig. 1). A nonresponder was defined as a patient who did not fill in the RTW questionnaire, whereas a responder was defined as a participant who filled in the RTW questionnaire at least once. Demographic characteristics of responders and nonresponders are provided in Appendix E1, available online on the *Journal*'s website at www.jhandsurg.org.

RESULTS

Patient selection and demographics

The database contained USO codes of 334 patients. Of these patients, 159 were confirmed as eligible, and 111 responded to the RTW questionnaire (response rate: 70%). The flowchart of the study is displayed in Figure 1.

The study sample consisted of 111 patients (71% female) with a mean age of 46 years (SD, 12 years). The median number of hours of employment per week was 32 (Q1−Q3, 24−40). Most patients performed moderate physical work (40%), followed by light physical work (34%) and heavy physical work (26%). Other patient characteristics are shown in Table 1. The patients improved in pain during physical loading after surgery, with the most improvement in the first 6 weeks (Figs. E1, E2, available online on the *Journal*'s website at www.jhandsurg.org; $P < .05$).

Return to work

The cumulative RTW during the first year following surgery was 92%. The median time until RTW was 12 weeks (95% confidence interval, 10−12 weeks; Fig. 2). The sensitivity analysis showed that the

TABLE 1. Characteristics of the Study Population at Baseline (n = 111)

Characteristic	Level	Value
Age, mean (SD)		46 (12)
Sex, n (%)	Female	79 (71)
Contractual hours, median [IQR]		32 [24–40]
Duration of complaints in months, median [IQR]		13 [8–29]
Treatment side, n (%)	Dominant	57 (51)
Preoperative PRWHE total score,* median [IQR]		67 [56–77]
Physical occupational intensity,† n (%)	Light	38 (34)
	Moderate	44 (40)
	Heavy	29 (26)
Second opinion, n (%)	Yes	20 (18)
Osteotomy technique, n (%)	Freehand	41 (37)
	External cutting device	70 (63)
Combined surgery‡	Yes	19 (17)
Cigarette smoker, n (%)	No	84 (76)
	Yes	19 (17)
	Unknown	8 (7)

IQR, interquartile range; PRWHE, Patient-Rated Wrist/Hand Evaluation.
*11% missing.
†Physical occupational intensity was categorized as light (eg, office), moderate (eg, working in a store), or heavy (eg, construction work).
‡Hardware removal of the distal radius (n = 6), pisiformectomy (n = 4), posterior interosseus nerve neurectomy (n = 3), trigger finger release (n = 2), carpal tunnel release (n = 1), wafer (n = 1), excision styloid process radius (n = 1), and excision mucoid cyst in the second distal phalanx (n = 1).

median time until RTW for 100% of the original contractual working hours was also 12 weeks (P = .7). During the twelfth week following surgery, there was a peak in which 16% of the patients returned to work. Eighteen patients were censored before the 1-year follow-up. Four patients (1 female with moderate work, 1 female with heavy work, and 2 males with moderate work) reported not returning to usual work after 1 year but performed adjusted work between 80% and 100% of their usual contract hours.

During the first year, 31 patients (28%) underwent a subsequent surgery to remove the plate. Return to usual work preceded hardware removal in all but 3 patients: 1 patient returned to work the week after the hardware was removed and 2 patients did not return to usual work after 1 year.

In the multivariable regression, the type of work was independently associated with RTW (Fig. 3). Patients with moderate or heavy work returned later than patients with light work (HR = 0.50–0.51). The cumulative RTW after 1 year following surgery was 100% for light work, 86% for moderate work, and 91% for heavy work, with median times until RTW of 8, 12, and 14 weeks, respectively (Fig. 4). Descriptive data on RTWs for other subgroups are shown in Tables 2 and 3.

DISCUSSION

In this study, we described the return to usual work in our cohort of patients who underwent USO. We found that 92% of the patients returned to usual work during the first year following USO. Half of the patients returned to work within 12 weeks. We observed large variations in the timing of returning to usual work between different levels of work.

Previous studies reported descriptive data on RTW following USO. Sunil et al[5] found that 65% of the patients treated with a freehand USO returned to usual work in 14 weeks (range, 0–28 weeks) and 63% of the patients treated with an assisted osteotomy jig returned to usual work in 13 weeks (range, 0–50 weeks). Luria et al[6] did not report on the time until return to usual work but reported a 92% RTW rate in the freehand USO group and a 94% RTW rate in the assisted osteotomy group. Minami and Kato[7] reported that 92% of their patients returned to their usual work. Auzias et al[27] reported an RTW time of 32 weeks. Lastly, Papatheodorou et al[4] reported an average RTW of 16 weeks in all patients. From these findings, we conclude that most patients are capable of returning to their usual work; however, the timing until RTW varies substantially between patients.

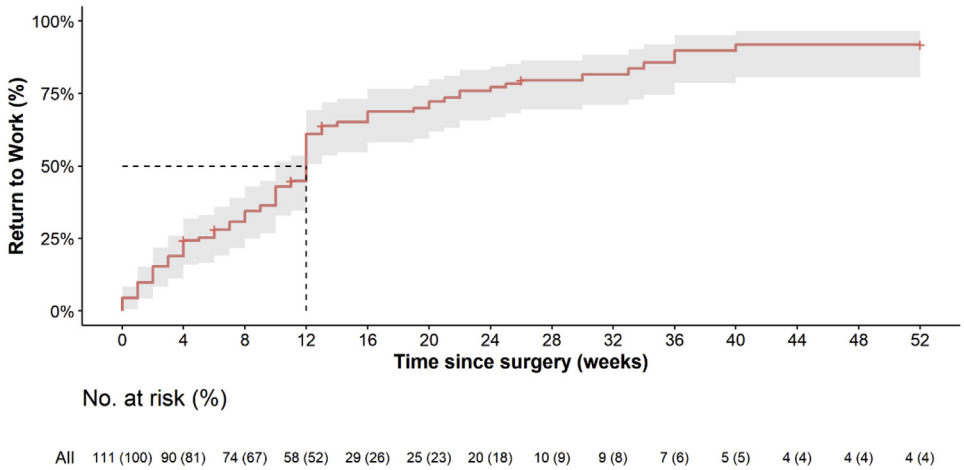

FIGURE 2: Kaplan-Meier curve for RTW after USO, in weeks, with 95% confidence intervals. The black dotted lines show the median time until RTW.

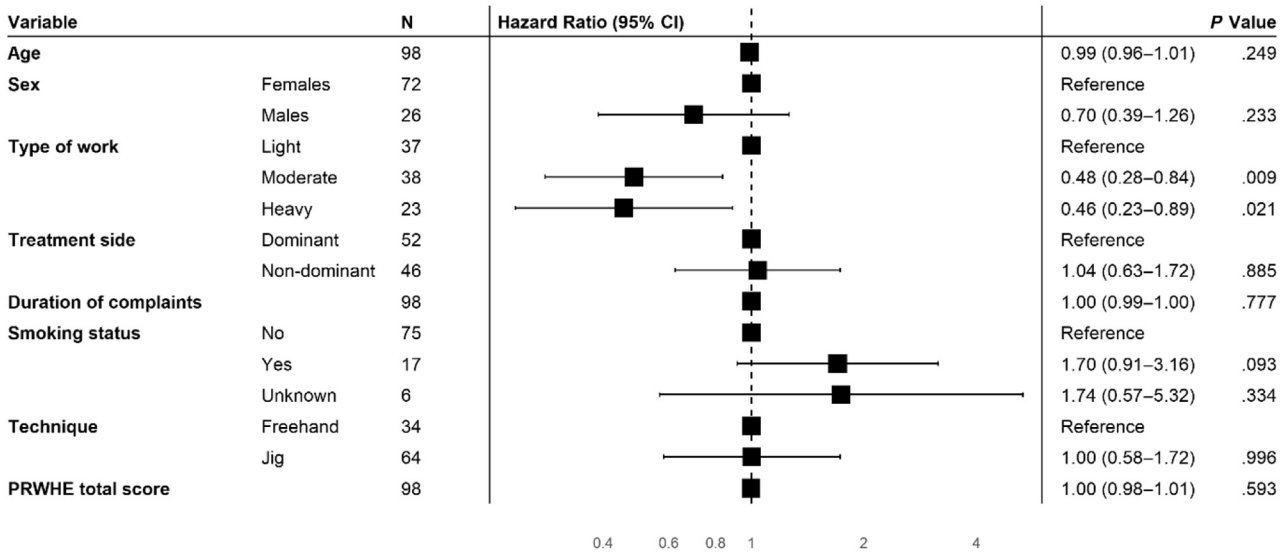

FIGURE 3: Results from the multivariable Cox regression analysis for return to usual work for >50% of the usual contract hours using patient characteristics, surgical technique, and preoperative PRWHE scores as covariates. An HR > 1 indicates a higher likelihood to return to work, whereas an HR <1 indicates a smaller likelihood to return to work in comparison to the reference group. Patients without preoperative PRWHE scores were excluded from this analysis (n = 13). CI, confidence interval; PRWHE, Patient-Rated Wrist/Hand Evaluation.

The type of work is a recurring predictor for the time until RTW following multiple hand injuries and surgeries.[10] A study from Moermans et al[3] investigated times until RTW following USO in a small sample of 10 and 18 patients with light and heavy physical work, respectively. They found that 90% of the patient with light physical work returned after 3 months (range, 1−11 months), whereas 83% of the patients with heavy work returned after a mean of 8.3 months (range, 0.5−30 months). In our study, we found shorter durations until RTW of 8 and 14 weeks for light and heavy physical work, respectively. Moermans et al[3] acknowledge that their reported duration until osteotomy union was longer than those of other studies, which could have prolonged the RTW. In our study, the median times until RTW for light and heavy work are in line with the general instructions of the postoperative regimen to avoid pronation and supination in the first 5 to 6 weeks and to avoid forceful load bearing in the first 7 to 13 weeks. However, it should be noted that some patients, including some in the heavy work category, were able to RTW sooner than the general instructions.

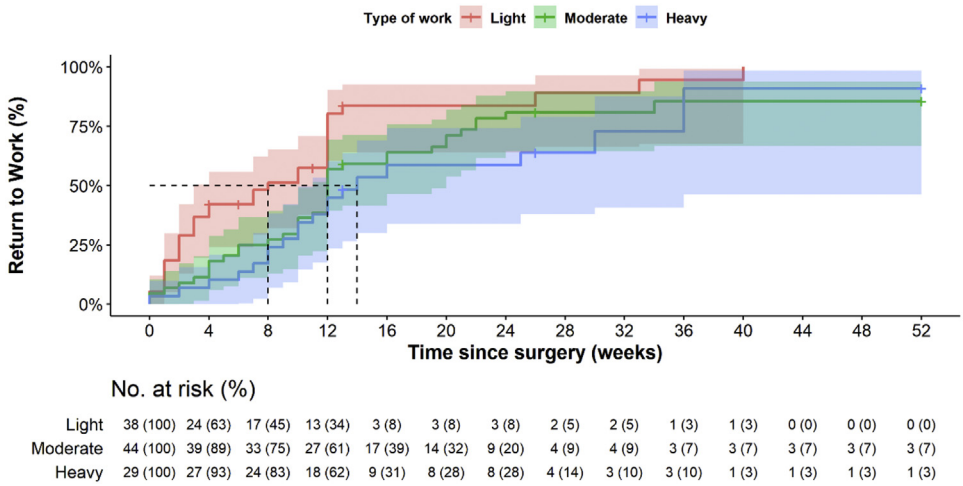

FIGURE 4: Kaplan-Meier curve for RTW after USO in weeks, with 95% confidence intervals stratified by type of work (red = light; green = moderate; blue = heavy).

TABLE 2. Sociodemographic Characteristics of Patients Who Provided Data on the RTW Questionnaire (Responders) and Patients Who Did Not (Nonresponders)

Characteristic	Level	Responders	Nonresponders
n		111	48
Age, mean (SD)		46 (12)	44 (14)
Sex, n (%)	Female	79 (71)	28 (58)
	Male	32 (29)	20 (42)
Duration of complaints in months, median [IQR]		13 [8, 29]	12 [8–24]
Treatment side	Dominant	57 (51)	28 (58)
	Nondominant	54 (49)	20 (42)
Preoperative PRWHE total score, median [IQR]		67 [56, 77]	73 [59–82]
Type of work,* n (%)	Light	38 (34)	15 (32)
	Moderate	44 (40)	20 (42)
	Heavy	29 (26)	13 (27)
Second opinion, n (%)	Ja	20 (18)	8 (17)
	Nee	91 (82)	40 (84)

IQR, interquartile range; PRWHE, Patient-Rated Wrist Hand Evaluation.
*The type of work was categorized as light (eg, office), moderate (eg, working in a store), or heavy (eg, construction work).

We did not find large differences between subgroups other than the type of work. Neutel et al[10] reported that females had a longer time until RTW compared to males, which we were not able to confirm. Opsteegh et al[28] reported that pain at baseline was a determinant of RTW in patients with hand injuries; our study did not find this effect. We did not find a difference in the RTW between freehand USOs and USOs guided by an external cutting device, which is in line with previous research.[5,6]

Our study has some strengths and limitations. The strengths include the comparison between different levels of physical workloads and the survival analysis allowing time-dependent estimates of RTW while dealing with losses to follow-up and minimizing bias. The first limitation was that we could not determine from the data to what extent the decision to RTW was externally guided. In the Netherlands, independent occupational physicians are responsible for instructions concerning RTW and the type of work that can be done. While surgeons should not interfere with these instructions, their advice on the type of tasks and load bearing allowed could have influenced the decision to RTW.

TABLE 3. Median Time Until Return to Usual Work for >50% of the Usual Contract Hours for Subgroups*

Variable	Median Time to RTW (95% CI)	1-Year Cumulative RTW
Age		
<49 y (n = 51)	12 (10–20)	96%
≥49 y (n = 60)	12 (10–12)	81%
Sex		
Females (n = 79)	12 (10–12)	95%
Males (n = 32)	13 (12 to NA)	81%
Type of work		
Light (n = 38)	8 (3–12)	100%
Moderate (n = 44)	12 (11–20)	86%
Heavy (n = 29)	14 (11 to NA)	92%
Treatment side		
Dominant (n = 57)	12 (10–16)	89%
Nondominant (n = 54)	12 (10–13)	96%
Smoking status		
No (n = 84)	12 (7–13)	96%
Yes (n = 16)	12 (10–16)	92%
Unknown (n = 8)	7.5 (4 to NA)	100%
Technique		
Freehand (n = 41)	12 (10–21)	92%
Assisted (n = 70)	12 (10–14)	91%
PRWHE score		
<67 (n = 46)	12 (10–16)	92%
≥67 (n = 53)	12 (9–14)	92%

CI, confidence interval; NA, not applicable; PRWHE, Patient-Rated Wrist/Hand Evaluation.
*Continuous variables were categorized based on the median value.

In future studies on RTW, we are incorporating a question on whether or when patients felt confident to return to their usual work following surgery, to compare these estimates with the actual RTW times. Second, we estimated the RTW with subjective questionnaires. Databases with information from public services could have provided a clearer picture, but these were not accessible. Third, the sample size was relatively small because of the exclusion of patients who did not have paid work before surgery, as well as nonresponses on the RTW questionnaires. The amount of missing data could potentially have led to selection bias. We adhered to the proposed rule of 10 events per independent predictor in the Cox regression analysis.[23] A larger sample size would have allowed more variables into the model, as well as HRs with smaller confidence intervals. Lastly, the postsurgical rehabilitation may have deviated from treatment protocols, thereby introducing possible bias. Therefore, the outcomes of this study are not specific to a certain postoperative treatment regime. However, our observational study design is representative of actual daily practice and reflects the results of multiple surgeons and hand therapists, and therefore has practical validity.

While we found that there was a large variation in the time until RTW between different levels of the physical intensity of work, we also found large variations within these subgroups. Work-related factors, such as working relationships, accommodations, and practical and physical limitations, are known to influence RTW outcomes in patients with musculoskeletal conditions and could have explained the variations within different levels of work.[29] Future research should incorporate when patients feel confident about RTW and how this is influenced by the type of work and psychosocial factors, such as pain catastrophizing. Finding psychosocial factors that contribute to a longer time to RTW can provide a focus for psychosocial interventions to reduce the time until RTW.

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APPENDIX E1

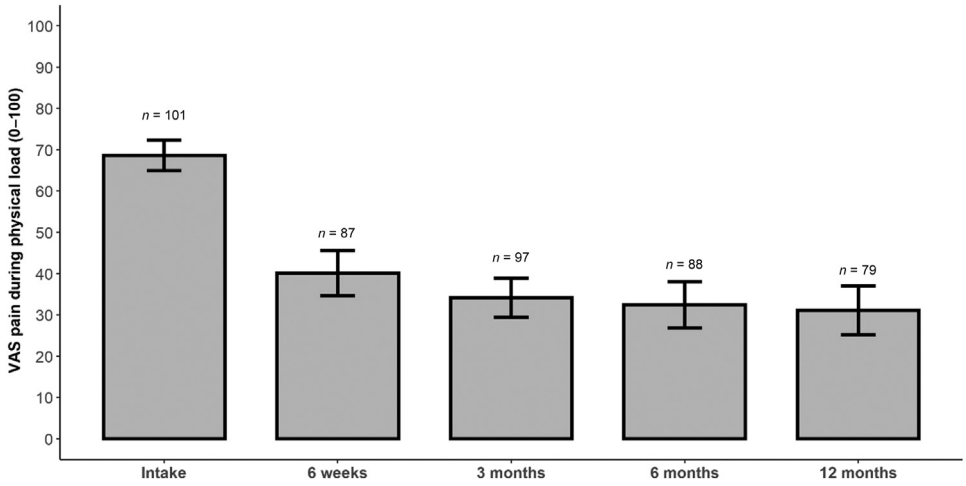

FIGURE E1: Pain during physical load as measured with a VAS for patients who underwent USO. Means and 95% confidence intervals are plotted. The linear mixed model analysis demonstrated a significant improvement over time ($P < .001$). VAS, Visual Analog Scale.

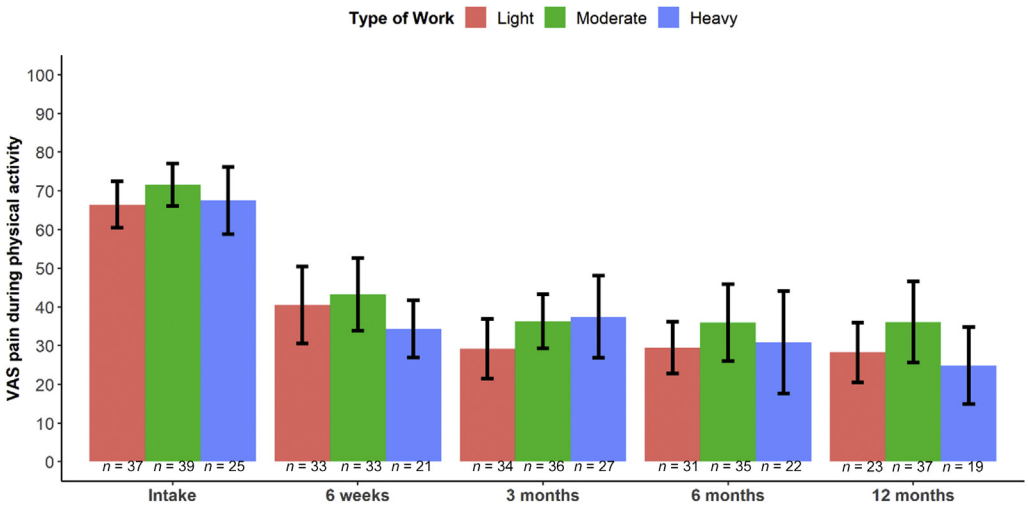

FIGURE E2: Pain during physical load as measured with a VAS for patients who underwent USO, stratified for the type of work (red = light; green = moderate; blue = heavy). Means and 95% confidence intervals are plotted. The linear mixed model analysis demonstrated a significant improvement over time for all types of work (each $P < .001$).

TABLE E1. Postoperative Therapeutic Regime After USO Since 2015

Time	Postoperative Regime
Day 0	Plaster cast is applied after surgery (including wrist and/or elbow); Tendon-gliding exercises; Sling
Day 10−12 (2012−2015)/ Day 3−5 (2015 to present day)	Removal of bandage and plaster cast; Thermoplastic wrist orthosis (day and night) or sugar-tong (surgical preference); Tendon-gliding exercises; Start hand therapy 2−3 times weekly
Week 2−4	Suture removal; Start scar management; On indication edema control (Coban); Optimization range of motion fingers and thumb (tendon-gliding exercises); Start active range of motion palmar flexion and dorsal flexion; Warning: no exercises for pronation and supination; Warning: no heavy load bearing
Week 5−6	Intensifying active range of motion palmar flexion and dorsal flexion; If applicable, replace sugar-tong with thermoplastic wrist orthosis; Warning: no exercises for pronation and supination; Warning: no heavy load bearing
Week 7−13	Start pronation and supination exercises; Warning: no intensive mobilization in maximal wrist positions; Start wrist exercises for coordination, strength, and stability; Increase load bearing and functionality; Phase out orthosis; Warning: no heavy load bearing
Month 3−6	Intensify range of motion wrist/forearm. Phase out orthosis during load bearing activities. Power training, stability training;
Months 7−12	On indication optimization of function