

ANTHROPOMETRY AND ENDOSCOPIC CARPAL TUNNEL RELEASE

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A prospective study was performed in 100 consecutive endoscopic carpal tunnel releases (ECTR) to assess the effect of a number of anthropometric measures on the ease of introduction of the ECTR system into the carpal tunnel. Ease of access to the carpal tunnel correlated with the wrist circumference, height and age of patients. Surgeons should be aware that ECTR is likely to be more difficult in small patients with small wrists and should have a higher threshold for conversion to the open technique to avoid neurological complications.

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The conventional open release is still the most popular operation for carpal tunnel syndrome (CTS). However, Martin et al. (1996) have shown that no incision avoids the risk of damage to the palmar cutaneous nerves. Consequently, open carpal tunnel release is often associated with a tender scar that delays the patient's return to activities of daily living (Brown et al., 1993; Kluge et al., 1996).

Endoscopic carpal tunnel release (ECTR), described by Chow as a two-portal technique (Chow, 1989), was developed by Agee into a single portal approach with no palmar incision (Agee et al., 1992; 1995). The advantages of this technique include avoidance of a palmar scar and less postoperative tenderness. Some studies have shown a more rapid return to normal activities and work (Agee et al., 1992; Palmer et al., 1993; Worseg et al., 1996). Despite concerns about its safety, large series have shown ECTR to be associated with a low complication rate (Agee et al., 1995; Shinya et al., 1995).

We have previously reported contusion of the median nerve occurring during introduction of the endoscope (Dheansa and Belcher, 1998). Two women with short stature and small wrists suffered contused median nerves in a series of 250 endoscopic releases. This suggested that the suitability of the procedure might be affected by body build.

The aim of this study was to correlate four anthropometric measurements (wrist circumference, weight, height, body-mass index [BMI]) to the ease of introduction into the carpal tunnel of the Agee Carpal Tunnel Release System (3 M Orthopaedic Products Division, St Paul, Minn, USA). Our hypothesis was that the access to carpal tunnel was likely to be more difficult in small wrists.

PATIENTS AND METHODS

Over an 8 month period, from February to September 1997, 70 consecutive patients (100 wrists) undergoing ECTR were prospectively studied. The surgery was performed by the senior author (HB) using a modified Agee single-portal technique. Our minor modification is to make a radially based "V" incision just ulnar to the palmaris longus tendon, in line with the fourth (ring-finger)

ray. If necessary, this can be converted to a standard open release more easily than the recommended transverse incision. A tourniquet was used in all cases. It was inflated just after skin marking and deflated before closure. The tourniquet time was noted.

Patients were excluded if they had previously undergone carpal tunnel release on the same hand or if they had surgical scars on the wrist due to previous flexor tendon injuries. Patients were also excluded if they required other procedures such as synovectomy, opponensplasty or decompression of Guyon's canal.

There were 49 women and 21 men. Their mean age was 53 years (range, 14-88). Bilateral releases were performed in 30 patients. The dominant hand was released in 52 instances. Seventy-five hands were operated on under general anaesthesia and 25 under regional anaesthesia using an axillary block technique.

Ease of access was assessed by the surgeon during the operation and expressed as easy, moderate or difficult depending on how tight the tunnel felt on introduction of the endoscope. For statistical purposes these were expressed as scores of 1, 2 and 3 respectively. A score of 4 indicated that introduction could not be effected and that conversion to the open technique took place (Table 1).

Wrist circumference, at the distal wrist-crease level, weight and height were measured preoperatively in all the patients before surgery. BMI was subsequently calculated from the height and weight ($\text{weight}/[\text{height}]^2$). The data from only one wrist was included for analysis in patients undergoing bilateral release as the wrist sizes were not independent variables. The side was chosen by randomization using year of birth (odd and even). Thus these factors were analysed in 70 wrists in 70 patients.

The results are presented as mean (standard deviation). Parametric and non-parametric tests were used as

Table 1—Subjective scale of ease of access

Score	Access ease
1	Easy
2	Moderate
3	Difficult
4	Conversion to open technique

Table 2—A summary of the results according to ease of access. Mean (SD)

Access ease	Tourniquet (min)	Age (yr)	Circumf. (mm)	Height (cm)	Weight (kg)	BMI (kg/m ²)
Easy	5.3 (2.2)	54.9 (14.9)	171 (13)	167 (9)	74.4 (15.0)	26.3 (4.6)
Moderate	6.3 (1.6)	55.3 (17.8)	164 (13)	163 (9)	70.1 (15.2)	26.4 (5.5)
Difficult	8.3 (2.2)	41.9 (16.2)	157 (11)	160 (8)	66.5 (14.1)	25.7 (5.5)
Conversion	-	48.7 (11.0)	153 (3)	158 (5)	67.3 (27.4)	27.0 (12.2)

indicated by the distribution of the data. Correlation was calculated by Pearson's or Spearman's tests. Significance was set at a value of $P < 0.05$.

RESULTS

Access was rated as "easy", "moderate" or "difficult" in 42, 33 and 21 wrists respectively. Four wrists were converted to the open technique because access was deemed too tight. These patients underwent a standard open release.

There were three complications in the series (3%) with reflex sympathetic dystrophy, infection and an incomplete release occurring in separate patients. There were no neurological complications.

Wrist circumference varied between 139 and 199 mm. It was correlated to the height ($r = 0.55$, $P < 0.0001$), weight ($r = 0.65$, $P < 0.0001$) and more weakly to the BMI ($r = 0.36$, $P < 0.005$) of patients, being greater in the taller, heavier and more obese (Table 2). The subjective tightness of the carpal tunnel was correlated with wrist circumference ($r = 0.43$, $P < 0.001$) (Fig 1). Wrists of smaller circumference were tighter. The ease of access was also weakly correlated to the height ($r = 0.33$, $P < 0.01$) and the age ($r = 0.27$, $P < 0.05$) of the patients. Access was more difficult in shorter and younger patients. There was no correlation between ease of access and weight, BMI, sex or hand dominance. The mean tourniquet time for ECTR was 6.3 (2.3) minutes. The tourniquet time was correlated to the ease of introduction ($r = 0.49$, $P < 0.0001$).

DISCUSSION

This series provides further evidence that ECTR is a satisfactory technique for the management of CTS with a low rate of complications. In our experience, the tourniquet time is comparable to that required for a standard open release. We consider it to be the operative treatment of choice for uncomplicated CTS.

A previous study has shown that ease of entry of the Agee device into the carpal tunnel was rated as easy or adequate in 90.6% of cases (Agee et al., 1995). It was suggested that access was more difficult in patients with a small frame size. The meaning of this term was not defined. Only two out of 1049 procedures were converted to the open technique specifically because of tightness.

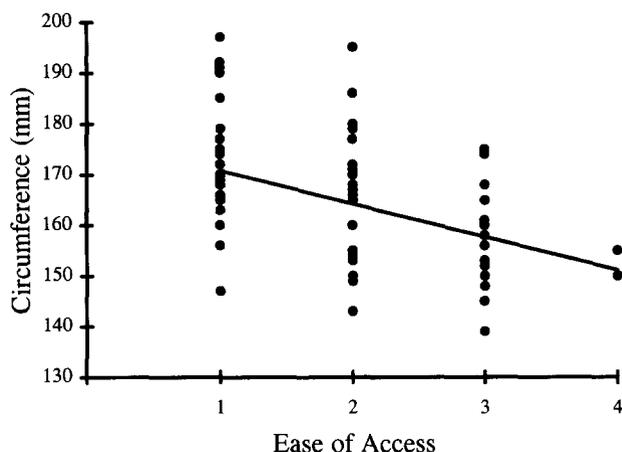


Fig 1 Relationship between circumference of the wrist and ease of access.

In the 100 wrists in our study, 21% of carpal tunnels were considered "tight" and 4% were converted to open release because of they were "too tight". The difference between these two series undoubtedly reflects our adoption of a more cautious approach following our experience with median nerve contusion (Dheansa and Belcher, 1998).

The tightness of a given space is influenced by both its volume and its contents. Magnetic resonance imaging can provide detailed anatomical information about the carpal tunnel (Ablow et al., 1994; Ham et al., 1996; Kato et al., 1994) and is potentially useful for diagnosis and for judging the effectiveness of endoscopic management of CTS. Similarly, continuous infusion has been used to measure pressure in the carpal canal both before and after endoscopic release of flexor retinaculum (Okutsu et al., 1989). Crenshaw et al. (1990) described a method of measuring the pressure changes with a transducer tipped fibre-optic catheter inserted in the carpal tunnel. Povlsen et al. (1997), using the same device in cadavers, showed that the endoscope is unlikely to cause damage to the median nerve by increasing carpal pressure during the release. None of these techniques can be realistically used in a clinical situation to judge the potential ease of access into the carpal tunnel.

Our study has shown that the subjective ease of access correlated with the wrist circumference, height and age of patients. Wrist circumference was the best predictor of

tightness, although the correlation was weak. This is not surprising as many factors influence circumference, including skeletal size, obesity and local factors such as synovial thickening. Nevertheless, measuring wrist circumference is rapid and cheap.

Our previous experience of contusion of the median nerve and the results of the present study suggest that the risk of neurological injury during ECTR is greater in patients with small stature and small wrists. We would advise a lower threshold for conversion from the endoscopic to the open technique in these patients. We now warn these patients that there is an increased chance of conversion. This concept is readily understood and accepted by them.

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