

Clinical experience of open carpal tunnel release and Camitz operation in elderly Chinese patients

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Objective To report preliminary experience on the Camitz operation for elderly Chinese patients in a Hong Kong public hospital.

Design Retrospective study.

Setting Tertiary referral hospital with hand surgery service in Hong Kong.

Patients Between January 2000 and January 2004, patients with carpal tunnel syndrome having the Camitz operation were recruited. They were assessed using the measurements of pinch and grip power, sensation, the Kapandji score, and functional grading as well as complications encountered during the subsequent follow-up.

Intervention The Camitz operation.

Results A total of 21 patients (8 male and 13 female; mean age, 70 years) were recruited. The mean duration of follow-up was 15 months. There was significant improvement in pinch power, grip power, and hand functions, as well as a positive correlation between the functional score and the Kapandji score. No major complication was recorded. One patient with pre-existing osteoarthritis of the ring finger developed contracture of the proximal interphalangeal joint.

Conclusion The Camitz operation is a simple, effective, and safe means of improving hand function in elderly Chinese patients with long-standing carpal tunnel syndrome and thenar muscle atrophy. Newly acquired strength in antepulsion of thumb resulted in improved pinch, grip, and hand function in this patient group.

Introduction

The median nerve plays a vital role in normal hand functions. Such functions include precise hand pinch, grip and sensation, which are all important for daily living,¹ and involve thumb opposition, which is essential for these complex hand movements. The latter consists of palmar abduction, pronation, and adduction of thumb. The motor branch of the median nerve innervates the abductor pollicis brevis, opponens pollicis and flexor pollicis, which produce palmar abduction. In long-standing carpal tunnel syndrome, atrophy of these muscles is common. They rarely recover after decompression, which is especially true in elderly patients. In order to improve thumb opposition function, decompression of the carpal tunnel together with opponensplasty should be considered.

Camitz first described the palmaris longus transfer for carpal tunnel syndrome with thenar muscle atrophy in 1929. Littler and Li² then combined the palmaris longus transfer and median nerve decompression as a simultaneous procedure in 1967.

This paper reviews the authors' experience in managing severe carpal tunnel syndrome in elderly Chinese patients. Sixty per cent of these patients lived alone in the daytime and cared for themselves. They all had thenar muscle atrophy, resulting in poor palmar abduction. The aim of this study was to review the results of the Camitz operation using different criteria, and thus to facilitate comprehensive treatment planning.

Methods

From January 2000 to January 2004, there were 21 patients older than 65 years, who had the

Key words

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Camitz operation in our hospital, following a primary diagnosis of idiopathic carpal tunnel syndrome and thenar muscle wasting. The diagnosis of the carpal tunnel syndrome was based on the history and clinical examination. In certain refutable cases, nerve conduction tests were also performed to confirm the diagnosis. The postoperative thenar muscle status, power of key pinch and hand grip, sensation, functional grading of cumulative trauma disorder and Kapandji score were studied 6 months after the operation.

An independent examiner conducted the clinical examination according to the study protocols. Thenar muscle bulk atrophy was graded as severe, mild-to-moderate, and none as described by Gelberman et al.³ Mild-to-moderate atrophy was defined as flattening of the thenar eminence, and severe atrophy as excavation along the proximal radial border of the thenar eminence.

Power of key pinch and hand grip was measured as a percentage of that on the normal side. The pinch and grip strength was tested using pinch gauge and hand grip gauge with position described by Mathiowetz et al.⁴ Three attempts were made with each hand and the average pinch result on the side of interest was then compared with that of the normal side for that patient. The severity of numbness was recorded on analogue scales and graded as mild, moderate, and severe.

The Kapandji index and functional grading of cumulative trauma disorders were two additional assessments performed to quantify the postoperative improvement. This index (also called the opposition scale) grades the range of opposition of the thumb. The

為老年華裔病人施行腕管切開鬆解減壓術和 Camitz 手術的臨床經驗

- 目的** 報告香港一所公營醫院為老年華裔病人進行 Camitz 手術的初步經驗。
- 設計** 回顧研究。
- 安排** 香港提供手部外科手術的第三層醫療服務轉介中心醫院。
- 患者** 2000年1月至2004年1月，患腕管綜合徵並曾接受 Camitz 手術的病人。評估包括量度病人的捏力和握力、知覺、Kapandji 評分表的得分、功能評級，以及術後隨訪期出現的併發症。
- 療法** Camitz 手術。
- 結果** 共21位病人參加研究，8男13女，平均年齡為70歲。術後隨訪期平均15個月。不論捏力、握力、手部功能均有明顯進步，而功能得分與 Kapandji 得分呈正相關，沒有記錄到主要併發症。一名患者的無名指由術前已患的關節炎惡化為近側指間關節攣縮。
- 結論** 對長期受腕管綜合徵困擾的老年華裔病人來說，Camitz 手術是一種簡單有效安全的方法，能提升手部功能和改善魚際肌萎縮的問題。拇指前推力的加強，增加了病人的捏握能力和手部功能。

patient was told to perform the movement as shown in Figure 1 and the score was charted from 1 to 10.

Functional grading was based on summation of scores calculated from the symptoms, eg pain, numbness and weakness, and function of the hand which included productivity and capacity of work. An

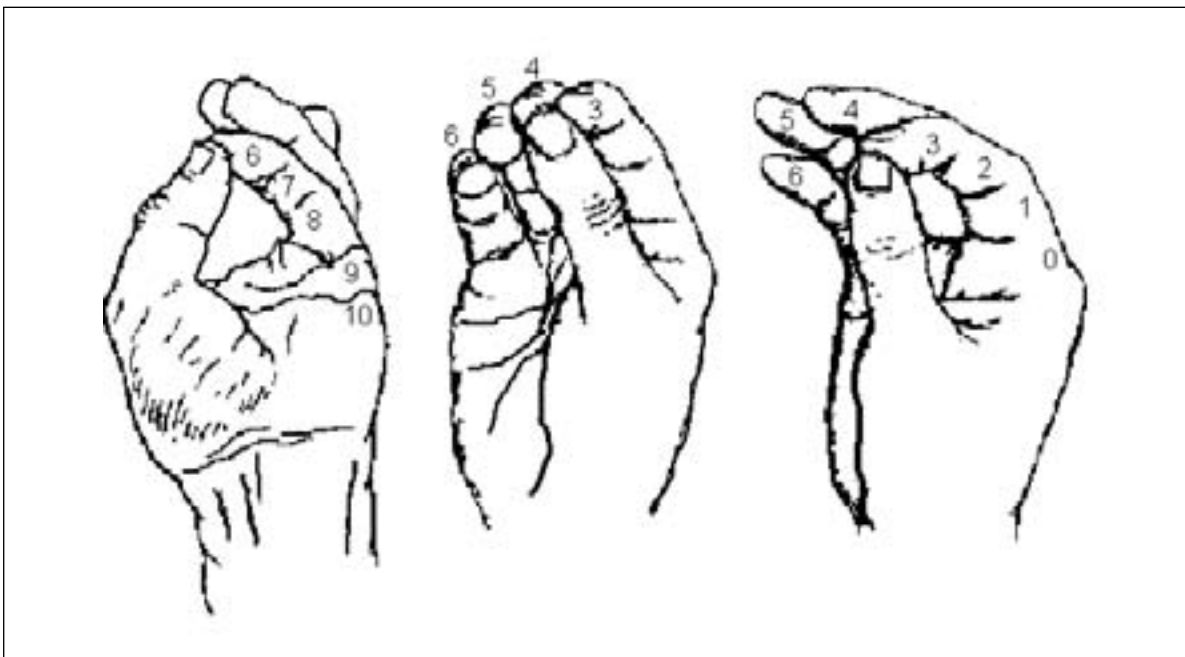


FIG 1. Kapandji index was scored by assessing patients' ability to perform the movement as shown

TABLE 1. Functional grading of cumulative trauma disorder

Grading	Description
Grade I	<ul style="list-style-type: none"> Pain after activity, resolves quickly with rest No decrease in amount or speed of work Objective findings usually absent
Grade II	<ul style="list-style-type: none"> Pain is consistent while working, but resolves when activity stops Productivity may be mildly affected May have objective findings
Grade III	<ul style="list-style-type: none"> Pain persists after activity is stopped Productivity affected, and multiple breaks may be necessary to continue working May affect other activities away from work May have weakness, loss of control and dexterity, tingling, numbness, and other objective findings May have latent or active trigger points
Grade IV	<ul style="list-style-type: none"> All common uses of hand/upper extremity cause pain which is present in 50 to 75% of the time May be unable to work or works in limited capacity May have weakness, loss of control and dexterity, tingling, numbness, trigger points, and/or other objective findings
Grade V	<ul style="list-style-type: none"> Loss of capacity to use hand because of chronic, unrelenting pain Usually unable to work Symptoms may persist indefinitely

TABLE 2. Patient numbers with preoperative and postoperative thenar muscle atrophy*

Thenar muscle wasting	Preoperation	Postoperation
None	0	0
Mild-to-moderate	17 (14)	20 (16)
Severe	4 (3)	1 (1)

* The number in brackets refers to patient numbers after exclusion of four patients with bilateral carpal tunnel syndrome

independent examiner assessed the patient after the operation, using the scoring system shown in Table 1.

Surgical technique

The presence of the palmaris longus was confirmed before the operation, by performing the simple manoeuvre of opposing the thumb to the little finger with the wrist flexed. The operations were all performed under Bier's block. A longitudinal zigzag incision from the distal palmar crease was extended to the point 2 to 3 cm proximal to the distal wrist crease. A 2-cm strip of palmar fascia together with the palmaris longus tendon was harvested. The transverse carpal ligament was then released and neurolysis of the median nerve was performed. Another incision was made on the radial side of the

thumb at the level of the metacarpophalangeal joint, and a subcutaneous tunnel was created for re-routing of the strip of the palmar fascia. The transfer was then secured to the abductor pollicis brevis and sutured to the dorsal radial side of the metacarpophalangeal joint of thumb. The tension of the transfer was then adjusted with the thumb in full opposition. A plaster cast was then applied to keep the thumb in extension and abduction for 4 weeks and with night splintage for another 2 weeks. The patient was allowed to start full range of motion exercise after the cast was removed.

Results

Twenty-one patients (13 female, 8 male) were recruited into this study. Their mean age was 70 (range, 65-79) years. The mean duration of symptoms was 14 (range, 4-24) months before they sought medical advice. Four of them had bilateral carpal tunnel syndrome. A total of 21 Camitz operations were performed in this group of patients.

Concerning muscle wasting, there was improvement in thenar muscle bulk in three (14%) patients only, all of them had severe wasting prior to surgery (Table 2).

The key pinch was measured before and 6 months after the operation. Preoperatively, compared

TABLE 3. Key pinch and hand grip

Percentage compared to 'normal' side	No. of patients			
	Key pinch		Hand grip	
	Preoperation	Postoperation	Preoperation	Postoperation
41-60%	16	3	12	2
61-80%	4	10	7	13
81-100%	1	8	2	6
P value		0.04		0.02

with the normal side, the affected side of 76% of the patients had 60% or less pinch strength. After the Camitz operation, 15 (71%) patients improved in terms of key pinch power ($P < 0.05$). Eighty-six per cent of patients had a key pinch of at least 60% in terms of strength when compared to the one on 'normal' side. Compared to the preoperative hand grip, postoperatively it improved in 14 (67%) of the patients. Ninety per cent of patients attained at least 60% of their hand grip compared to normal side (Table 3). After excluding the four patients with bilateral carpal tunnel syndrome, similar results were obtained. Namely, 76% of the patients attained improvement in terms of key pinch, while 71% of the patients achieved stronger hand grips. Eighty-two per cent and 88% of the patients respectively attained at least 60% of their strength with respect to key pinch and hand grip in comparison to the contralateral side.

There was no significant improvement in sensation after the operation. Forty per cent of the patients continued to experience mild-to-moderate numbness after the operation; only nine perceived some decrease in numbness after the operation.

The average preoperative Kapandji score was 7.7. Six months after the operation, the average Kapandji score was increased to 8.5. Fifteen (71%) of the patients enjoyed improvement after the operation (Fig 2).

Postoperatively, 18 (86%) of the patients improved in terms of their hand function; 12 (57%) achieved grade II hand function at 6 months after the operation.

Based on the Pearson correlation test, there was positive correlation between the Kapandji index and functional grading of cumulative trauma disorder ($P < 0.05$). Patients with higher Kapandji scores had better functional outcomes.

There were no major complications such as wound infection, nerve injury, or haematoma formation. After the operation, one patient with pre-existing osteoarthritis of the middle finger developed a contracture at the proximal phalange of the affected finger.

Discussion

Long-standing carpal tunnel syndrome may produce a low-grade median nerve palsy with subsequent loss of thenar muscle function. Concomitant sensory deprivation also aggravates the impairment. Elderly patients with carpal tunnel syndrome and muscle wasting may present with concurrent joint arthritis or muscle weakness that can complicate any attempt to restore motor power in a balanced way.⁵ In these patients, the aim of management is to decompress the median nerve and restore the thumb opposition, which is a complex action executed by a combination of motor units.⁶ The motion itself consists of palmar abduction, pronation, and adduction of thumb. No

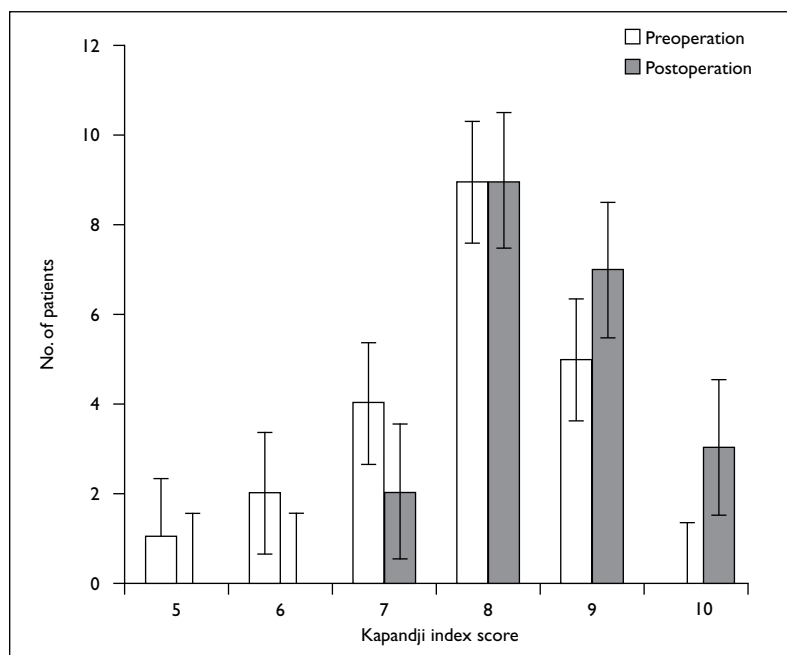


FIG 2. Preoperative and postoperative Kapandji scores
Error bars represent 95% confidence intervals

single tendon transfer is possible to restore true opposition.

Camitz first published his results from prolongation of the palmaris longus tendon and reattaching it onto the radial side of the first metacarpal joint. This method achieves elevation of the thumb metacarpal in a plane that is perpendicular to the palm. The procedure does not completely replace the complex function of true opposition of the thumb, but helps to initiate the force of convergence to the palm. The patient can then start flexion, adduction, and pronation of the thumb.⁷

The palmaris longus may be sacrificed without noticeable deficit. Its substantial length is also ideal for reattachment. Moreover it acts synergistically with the abductor pollicis brevis muscle.⁸ Absence of the palmaris longus in up to 15% of the normal population may pose a problem. In which case, formal opponensplasty has to be considered. Therefore, preoperative assessment to confirm the muscle's presence is mandatory.

In 73 patients with carpal tunnel syndrome and thenar muscle atrophy, Foucher et al⁵ reported that 91% of patients had good long-term results after the Camitz operation, and that 80% regained hand function. The mean age of their patients was 59 years. Terrono et al⁷ reported that 94% of their patients (mean age, 65 years) were satisfied with thumb function after the Camitz operation. By using the technique described by Camitz and Littler, we achieved comparable results in terms of improved pinch and grip strength, range of movement of thumb abduction, and hand function to those of the

two aforementioned series,^{5,7} though the mean age of our patients was 70 years.

The Camitz operation did not actually contribute directly to the improved pinch and grip strength by itself. Nevertheless, good antepulsion of the thumb after the operation allowed patients to converge the force of pronation, flexion, and adduction toward the palm. Patients are then in a better position to function normally. Brand⁸ also described the important role of abduction in the production of active pronation. Besides the production of good pulp-to-pulp pinch, it is capable of locking the carpometacarpal joint during key pinching. The increase in hand activities leads to the strengthening of the other hand muscles. In our study, overall hand function, as well as pinch and grip strength, improved as a consequence.

In this study, the improvement of the key pinch and hand grip was compared to the asymptomatic (contralateral) side, so as to eliminate the difference of individual baseline hand strength. There were four patients with bilateral carpal tunnel syndrome. Although they had no complaint of thenar muscle weakness or documented thenar muscle atrophy on presentation on the non-operated side, theoretically they could confound the results. Therefore, we calculated another set of results for key pinch and hand grip with their data excluded. For patients with bilateral thenar atrophy, comparison with the contralateral side is obviously less meaningful, in which postoperative improvement of the key pinch and hand grip strength from preoperative (baseline) hand strength could be helpful.

No substantial improvements in numbness were noted on our analogue scale; only nine (43%) patients showed improvement after the operation. Similar results were also reported by Thurston and

Lam,⁹ showing that only around 50% of patients improved considerably or returned to normal following carpal tunnel release. Notably the majority (86%) of patients did not regain thenar muscle bulk after the decompression.

Other studies^{10,11} also showed that isolated carpal tunnel release is less satisfactory in elderly patients with carpal tunnel syndrome. The differences were most significant for patients older than 60 years, consistent with previous experience⁵ with the Camitz operation.

The positive correlation between the functional grading score and the Kapandji score is another interesting finding from our study. The Camitz operation can improve the hand function in terms of functional grading as well as the Kapandji index. With the restoration of the hand function, the patients have better capacity to handle the activities of daily living. The Kapandji index is a simple and convenient physical examination for daily practice. It evaluates the combined consequence of the transfer and the complex action of thumb opposition. Obviously, if a patient attains a higher Kapandji index score, the range of the opposition also increases. The better the restoration of the thumb opposition, the better the ensuing functional outcome.

Conclusion

The Camitz operation is a simple, effective, and safe means of improving the hand function in long-standing carpal tunnel syndrome with thenar muscle atrophy in elderly Chinese patients. There was minimal loss of donor muscle function, a low incidence of postoperative complications, and reproducible outcome. Newly acquired strength in antepulsion of the thumb results in more balanced motor power for hand and pinch grips, and in turn results in substantial functional improvement.

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