Cumulative Trauma Disorders in Betel Pepper Leaf-Cullers Visiting a Rehabilitation Clinic: Experience in Taitung

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Background: Betel pepper (*Piper betle L.*) cultivation is an important agricultural industry in Taitung, Taiwan, and culling leaves is very labor-intensive. This case study compares the proportion of cumulative trauma disorders (CTDs) between cullers and those with other occupations.

Methods: Patients with musculoskeletal disorders in the rehabilitation clinic of a local hospital in Taitung were enrolled. This all female cohort was divided into a culler group (betel pepper cullers, n = 20), and a non-culler group (other occupations, n = 47). Three cullers were interviewed, and were also recorded to elucidate the related ergonomics. Patients were diagnosed using plain radiography and ultrasonography.

Results: The act of culling involves an overhead internal rotation of both shoulders with extended elbows while standing, followed by wrist flexion and forearm pronation. Flexing of the fingers is also required by the tools, 'iron nails' fitted onto both thumbs. The proportions of patients with shoulder impingement syndrome (SIS) and carpal tunnel syndrome (CTS) were significantly higher among cullers than non-cullers (0.45 vs. 0.15, $p = 0.011$ and 0.40 vs. 0.06, $p = 0.002$, respectively). Furthermore, the total frequency of CTDs displayed a positive linear correlation with employment duration ($r = 0.618$, $p = 0.004$).

Conclusions: Proportions of occupational SIS and CTS were higher among betel pepper cullers than those with other occupations. These CTDs may have resulted from a prolonged static posture and repetitive motions during culling.
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Key words: cumulative trauma disorder, occupational injury, ultrasonography, shoulder impingement, carpal tunnel syndrome.

Betel nut (*Areca catechu*) chewing is a popular custom in Southeast Asia, including Taiwan. The leaf of the betel pepper (*Piper betle L.*) is used to wrap the betel nut, and the 2 are chewed together to improve the taste. Betel pepper is a bushrope, and the leaf has a peppery aroma. In Taiwan, almost all betel pepper leaves are cultivated in Taitung County, southeastern Taiwan. The harvesting of betel pepper leaves is a significant industry in Taitung with large production costs. One sequence in the production of leaves, the culling, is very labor-intensive, and the health of the cullers has traditionally received no

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attention from medical care organizations. No scientific literature about betel pepper cullers was found.

One of the most-common health problems among industrial workers, cumulative trauma disorder (CTD, also referred to as repetitive strain injury), is a subgroup of musculoskeletal disorders (MSDs). CTDs affect a variety of tissues: muscles, tendons, bursa, ligaments, peripheral nerves, bones, cartilage, and intervertebral disks.[1] CTDs encompass cervical myofascial pain (CMP), shoulder impingement syndrome (SIS), thoracic outlet syndrome, epicondylitis, carpal tunnel syndrome (CTS), cubital tunnel syndrome, ganglion, DeQuervain tenosynovitis (DQT), trigger finger, and mechanical low-back pain (MLBP).[2] Most studies on CTDs have involved workers in industrial or office settings,[1,3] with little attention given to agricultural workers.[4-6] Several factors contribute to occupational CTDs, including forceful exertion, repetitiveness of a task, the biomechanical posture, vibration, temperature, localized contact stress, and tool use and design.[2] The etiology of CTDs includes the idea that repetition of movements does not allow muscles, tendons, or ligaments sufficient recovery time and therefore, can damage these structures.[7]

High-resolution ultrasonography is a convenient, non-invasive, and inexpensive modality to examine musculoskeletal systems. Its value is widely recognized for rotator cuff diseases, SIS, and cystic lesions. In recent years, a reliable diagnosis of CTS can be made sonographically based mainly on an increase in the cross-sectional area of the median nerve at the level of the pisiform or hamate bone.[8] High-resolution ultrasonography may be valuable in diagnosing CTS in settings lacking the electrodiagnostic study equipment for the confirmatory laboratory examination of CTS.

In a local, primary care hospital in Taitung, betel pepper cullers were considered to suffer from many MSDs. Therefore, the present case study was designed to clarify whether MSDs in betel pepper cullers were above average, and whether or not these problems were related to culling practices.

METHODS

Patients

From October 2003 to January 2004, this investigation enrolled all adult patients with the chief complaint of MSDs presenting over 3 months, unrelated to acute injuries, attending the rehabilitation outpatient department of a local, primary care hospital in Taitung. All patients signed an informed consent form and answered a questionnaire concerning hand dominance, medical and surgical history, and occupational history. Patients with important neurological or musculoskeletal impairments, such as stroke, severe head injury, a dislocation, fracture, or amputation, were excluded. Patients with systemic diseases commonly involving musculoskeletal systems, such as diabetes mellitus, gout, or uremia, were also disqualified from this case study. Subjects who had worked full-time as betel pepper cullers over the last 3 months were compared with subjects who did not work in betel pepper production. Altogether, 149 patients were enrolled in this study. Patient demographics are summarized in Table 1. Because of the extreme differences in age and gender distributions between the betel pepper cullers and other occupations, only female patients aged from 40 to 64 years old were analyzed (67 patients). These subjects were divided into 2 groups: a culler group (betel pepper cullers), and a non-culler group (those with other occupations). Patients who were betel pepper cullers filled out an additional questionnaire about the temporal conditions of employment duration (years, weeks per year, days per week, hours per day) to estimate total hours employed. Three betel pepper cullers working on different farms (patients 3, 4, and 12) were interviewed, photographed, and videotaped regarding their working environment on the farm. Posture, motion, and a task cycle, including repetition frequency, pauses, and cycle time of betel pepper culling were analyzed and measured according to the photographs and videotapes. The Chairman of the Taitung Association of Betel Pepper Production and Sale (an organization of farm owners of betel pepper) was interviewed for details of this industry.

Table 1. Patient Demographics

	Betel pepper cullers (n = 22)		Other occupations (n = 127)	
	Male	Female	Male	Female
Age (yr)				
< 40	0	1 (4.6)	13 (10.2)	25 (19.7)
40~64	1 (4.6)	20 (90.9)	26 (20.5)	47 (37.0)
≧65	0	0	7 (5.5)	9 (7.1)

Number of patients (percentage).

Diagnosis

All patients were examined and diagnosed by a board-certified rehabilitation physician (LYW) experienced in musculoskeletal ultrasonography. Detailed histories were taken, and physical examinations were performed on all patients. Plain radiography and high-resolution ultrasonography (Sonos 4500® with a 3~11-MHz linear-array transducer, Philips, Eindhoven, Netherlands) were used on particular patients. Cervical spondylosis (CS) was diagnosed when there was neck pain with obvious osteophyte formation on plain radiography of the cervical spine. CMP was diagnosed for pain, tenderness, tightness, and taut band(s) over the neck or upper back area, without root-distribution radicular pain or paresthesia, and the absence of osteophyte formation or disc space narrowing on plain radiography of the cervical spine.[2] SIS was diagnosed when shoulder pain and tenderness accompanied the positive supraspinatus test,[9] or positive Hawkins impingement test,[10] with typical findings on ultrasonography, such as wall-thickening or fluid collection in the subacromial-subdeltoid bursae, hypoechoic thickening or an anechoic gap of the rotator cuffs, and dynamic impingement (Fig. 1).[11] The diagnosis of lateral epicondylitis (LE) was made when pain and tenderness developed over the lateral epicondyle, especially during resisted wrist extension with the elbow extended.[2] A diagnosis of CTS was made either when there were pain and paresthesia at the wrist, hand, and fingers, compatible with the sensory distribution of the median nerve, accompanied by a positive Phalen test,[2] or when the cross-sectional area of the median nerve at the level of the pisiform bone on ultrasonography was > 0.11 cm^2 in combination with compression signs on a longitudinal scan (Fig. 2).[12] A nodule or mass at a joint or tendon, and a simple cystic lesion on ultrasonography was diagnosed as a ganglion cyst.[2,11] DQT was diagnosed by radial wrist pain with a positive Finkelstein test.[2] Trigger finger or thumb was diagnosed by finger or thumb pain when in motion and "riggering", with a tender nodule at the volar aspect of the metacarpal head.[2] When low-back pain occurred, lumbosacral spondylosis (LSS) was diagnosed if significant osteophytes existed on plain films of the lumbosacral spine. If neither of the above findings nor other bony pathology such as spondylolisthesis appeared on the x-ray film, patients with low-back pain and muscular tenderness and tightness were deemed to have mechanical low-back pain. Osteoarthritis (OA) of the knee was identified by clinical manifestations in combination with x-ray findings. Heel pain was diagnosed with characteristic symptoms (progressive worsening pain during exertion and a dread of taking the first step out of bed in the morning),[9] or a thickening of the plantar fascia on ultrasonography matching the diagnosis of plantar fasciitis.[12] CMP, SIS, LE, CTS, a ganglion cyst, DQT, trigger finger or thumb, and MLBP were categorized as CTDs.[2,3] CS, LSS, spondylolisthesis, OA of the knee, and plantar fasciitis were classified as degenerative MSDs (DMSDs).

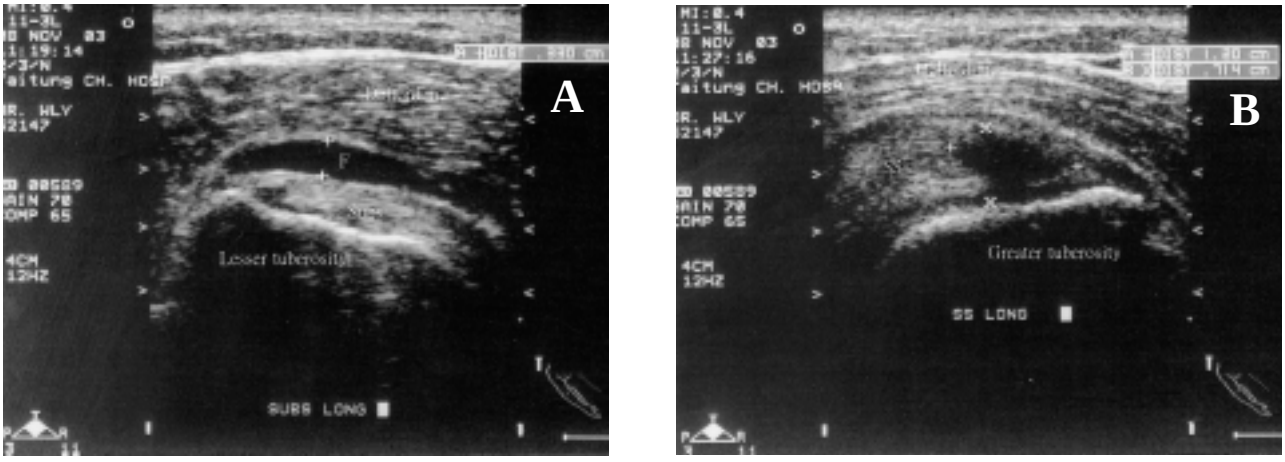

Fig. 1 Ultrasonography of shoulder impingement syndrome (patient 11). (A) Fluid (F) collection in the subacromial-subdeltoid bursae overlying the subscapularis tendon (Subs) on a longitudinal scan. (B) Hypoechoic thickening with an anechoic gap (between the calipers) in the supraspinatus tendon (SS) on a longitudinal scan, representing a full-thickness tear.

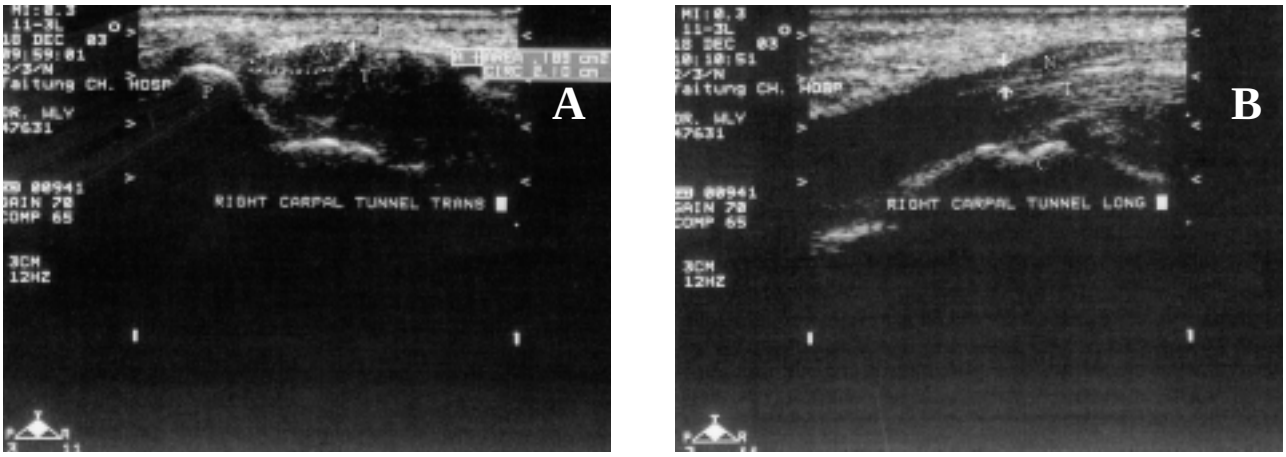

Fig. 2 Ultrasonography of carpal tunnel syndrome (patient 17). (A) Increased cross-sectional area of the median nerve (N) at the level of the pisiform bone (P) on a transverse scan. (B) The median nerve (N) compressed (between the arrows) by the thickened transverse carpal ligament (L) on a longitudinal scan.

Analysis

Bilateral disorders were assessed as 2 separate disorders, and all diagnoses of CTDs or DMSDs were summed as total CTDs or total DMSDs in a given patient. Therefore, a single patient may have had both CTDs and DMSDs, as well as several different CTDs diagnosed. All data were statistically analyzed using the SPSS (Chicago, IL, USA) statistical package version 8.0. Differences between the culler and non-culler groups were analyzed using the non-paired t-test (age), Chi-squared test (proportions of CTDs, DMSDs, CS, and LSS), and Fisher's exact test (proportions of CMP, SIS, LE, CTS, MLBP, other CTDs, OA of the knee, lumbar spondylolisthesis, and other DMSDs). The associations of total CTDs with age and total employed hours for patients in the culler group were analyzed using Pearson's correlation. The correlation coefficients were checked using the F test. Statistical significance was defined as a p value of < 0.05.

RESULTS

Ergonomics

According to the description of the Chairman of Taitung Association of Betel Pepper Production and Sale, there are at least 1000 full-time betel-pepper cullers working on about 120 farms in Taitung. Interviews with cullers and observations on several farms revealed that every working day, cullers worked continuously, with lunch (usually 1.5~2 h) as their only regular, longer rest interval. Cullers also stopped their work intermittently for several seconds if they suffered soreness or pain. The espaliered betel pepper grows approximately 1.8 m, and new leaves mostly grow above adult head-level. The posture to cull the leaves of betel pepper requires an erect stance with flexion of both shoulders overhead and internal rotation, both elbows extended with pronation, and wrist and finger flexion (Fig. 3). The motion of culling the leaf off the stem consists of approaching the leaf with wrist flexion, pinching the leaf-stalk with the thumb and index finger, and then severing the leaf with a twisting force from wrist flexion and forearm pronation. A culler normally wears gloves, with a simple tool called an “iron nail” superimposed on both thumbs of the gloves, to facilitate cutting the stalk (Fig. 4). The culler holds the culled leaf temporarily in his/her hands, maintaining the posture, and repeats the culling motion until the hands are full, and then the leaves are thrown into a basket. The average cycle time of the culling task was 52.6 s, consisting of 46 s culling and 6.5 s of pause time (for throwing or resting). The average repetition frequency was 0.48 Hz for the dominant hand and 0.28 for the non-dominant hand in a cycle. Therefore the average repetitions of the culling task were 1728 and 1008 per h for the dominant and non-dominant hand, respectively.

Statistics

There were 20 patients in the culler group and

Fig. 3 Posture during culling: standing erect, with both shoulders flexed overhead and internal rotation, and both elbows extended with pronation.

Fig. 4 Culling a betel pepper leaf: with an "iron nail" superimposed on the glove of both thumbs, and with the wrists and fingers flexed.

47 in non-culler group, without significant age differences (50.55 ± 5.85 vs. 49.06 ± 5.97, $p = 0.35$). All patients in the culler group were right-handed; whereas, there were 2 left-handed patients in the non-culler group. Patients in the non-culler group were further divided into 8 occupational subgroups which included 14 housewives (29.8%), 12 office workers (including civil servants and cashiers, 25.5%), 5 farmers (including agricultural workers not related to betel pepper, 10.6%), 5 heavy manual labors (10.6%), 4 teachers (8.5%), 3 tailors (6.4%), 2 hair dressers (4.3%), and 2 businessmen/women (4.3%). The average employment duration in the culler group was 9.33 years (9.33 ± 5.39, represented as "Y"), 6 days/week (6.00 ± 0.86, represented as "D"), and 8.83 h/day (8.83 ± 1.93, represented as "H"). All cullers worked 52 weeks/year. So altogether the average total employed time was estimated to be 28,151.5 ± 19300.5 h by the formula of 52 x Yx D x H.

The proportion of CTDs in the culler group was higher than that in the non-culler group (0.90 vs. 0.53), and was statistically significant ($p = 0.004$). Although the proportion of DMSDs in the culler group was 0.45 and that in the non-culler group was 0.70, they did not statistically differ ($p = 0.051$). Proportions of individual CTDs in the culler group were assessed as given in Table 2. Of the 3 patients with "other CTDs" in the culler group, 1 had a ganglion cyst in the right dorsal wrist, another had left DQT, while the third had a left trigger thumb. The proportions of SIS and CTS were significantly higher in the culler than in the non-culler group (0.45 vs. 0.15, $p = 0.011$ and 0.40 vs. 0.06, $p = 0.002$, respectively). However, no statistically significant differences of proportions occurred among other disorders between the 2 groups.

The correlation coefficient (r) of total CTDs with age in patients in the culler group was 0.186, with a p value of 0.432, so it was not statistically significant. For patients in the culler group, there was a significant correlation between total CTDs and total employed hours ($r = 0.618$, $p = 0.004$, Fig. 5).

DISCUSSION

Study Design

Betel peeper leaf culling is a major agricultural industry in Taitung, and cullers' health has not systematically been evaluated, even though there is an impression of more MSDs among cullers than among general patients. We hypothesized that betel pepper cullers suffer more occupation-related MSDs or CTDs than other groups. Although many studies of CTDs have enrolled patients who have had musculoskeletal symptoms for longer than 24 h, this study defined the inclusion criterion as a duration of 3 months for both musculoskeletal symptoms and employment to ensure sufficient exposure and to exclude acute or short-term insults, such as sprains/strains. In our patients with no history of important trauma or neurological diseases, CS, LSS, spondylolisthesis, OA of the knee, and plantar fasciitis were reasonably classified into DMSDs. Most

Table 2. Proportions (and Number of Patients) with Cumulative Trauma Disorders (CTDs) and Degenerative Musculoskeletal Disorders (DMSDs) in the Culler and Non-culler Groups

	Culler group (n = 20)	Non-culler group (n = 47)	*p*
CTDs	0.90 (18)	0.53 (25)	0.004
Cervical myofascial pain	0.10 (2)	0.13 (6)	0.554
Shoulder impingement syndrome	0.45 (9)	0.15 (7)	0.011
Lateral epicondylitis	0.15 (3)	0.11 (5)	0.446
Carpal tunnel syndrome	0.40 (8)	0.06 (3)	0.002
Mechanical low back pain	0.25 (5)	0.13 (6)	0.188
Others	0.15 (3)	0.11 (5)	0.446
DMSDs	0.45 (9)	0.70 (33)	0.051
Cervical spondylosis	0.25 (5)	0.32 (15)	0.398
Lumbosacral spondylosis	0.25 (5)	0.34 (16)	0.533
Osteoarthritis of knee	0	0.13 (6)	0.108
Lumbar spondylolisthesis	0	0.06 (3)	0.233
Others	0	0.11 (5)	0.159

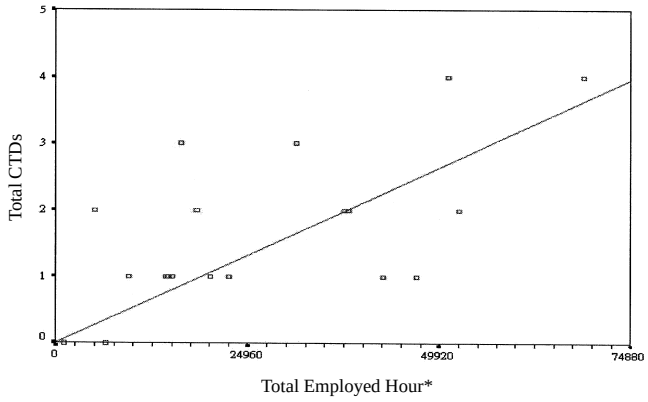

Fig. 5 Linear correlation of total CTDs and total employed time (h) in the culler group. * The figure 24,960 h is equivalent to 10 years' employment at 52 weeks per year, 6 days per week, and 8 h per day.

betel pepper cullers were middle-aged women. By analyzing observations from photographs and videotapes made on the farms and interviews with 3 patients in the culler group, the investigation revealed the ergonomics of betel pepper culling.

CTDs between the Two Groups

Our study data indicated more-frequent CTDs (but not DMSDs) among cullers than non-cullers. However, the occupational subgroups in the non-cullers were quite diverse (8 categories), and very frequent CTDs were noted in farmers and teachers (4 of 5 and 3 of 4, respectively, data not shown). In fact, statistically, only greater incidences of SIS and CTS were noted among cullers than non-cullers. CTDs are known to develop in office workers, farmers, heavy manual labors, hair dressers, and tailors.[1-3] Recently some literature has reported an increased risk of CTDs in housewives and teachers.[13,14] Generally speaking, CTDs develop because of repetitive or forceful movements or a static posture during working. DMSDs are viewed as aging processes and had developed in both the culler group and non-culler group without significantly different rates.

Shoulder Impingement Syndrome (SIS)

The higher rates of SIS among cullers may be related to the posture of the shoulder region while culling, as mentioned in the literature.[16,17] The etiology of SIS can be classified as intrinsic or extrinsic. Intrinsic causes include trauma or degeneration of the rotator cuff with instability or laxity of the shoulder complex. Extrinsic causes include bony changes to the acromion, coracoid, or acromioclavicular joint, or greater tuberosity, cervical root compression, and rheumatic disorders.[2] Some writers divide the causes of SIS into primary and secondary impingement. Primary impingement is due to the rigid coracoacromial arch (stenotic), while the secondary impingement syndrome is defined as a relative decrease in the supraspinatus outlet caused by instability of the glenohumeral joint (nonstenotic).[18] Carpenter et al. reported the effects of overuse in rotator cuff tendinosis in an animal model, and demonstrated that damage to the supraspinatus tendon can be caused by overuse and intrinsic injury, overuse and extrinsic compression, or by overuse alone.[19] Soslowsky et al. also reported that extrinsic compression of the rotator cuff alone may be insufficient to cause tendinosis without additional factors, such as overhead activity; and that more injuries are caused by overuse plus extrinsic compression than by overuse or extrinsic compression alone.[20] SIS is a multifactorial condition, to which overuse, such as repetitive overhead motion, contributes.

Carpal Tunnel Syndrome (CTS)

Michelsen and Posner categorized the etiologies of CTS as idiopathic/spontaneous, intrinsic factors outside the nerve, intrinsic factors within the nerve,

extrinsic factors that alter the contour of the tunnel, exertional/overuse, and neuropathic factors. Most cases of CTS are idiopathic, involving increased interstitial pressure in the carpal tunnel.[21] The symptoms tend to be exacerbated by activities that place loads on the tendons passing through the canal, such as holding a book, driving a car, or using hand-held tools.[22] There are numerous causes for occupational CTS, including high-force, high-repetition jobs, prolonged posturing, and vibration.[2] The motion of culling may induce CTS in cullers. The pathogenesis of occupational CTS is not yet well established. Kasdan and Lewis stated that scientific evidence does not prove that "repetitive use" of the hands causes "cumulative trauma".[22] The occurrence of CTS is related to repetitive and forceful tasks, but the cause-and-effect relationship remains unclear.

Other Cumulative Trauma Disorders (CTDs)

The literature reveals that repetitive elbow pronation with the elbow extended is thought to be the cause of LE. Static standing for a long time may trigger MLBP or a ganglion cyst at the wrist, while DQT may be due to repetitive wrist motion, and trigger finger or thumb may be related to repetitive finger flexion and local contact stress on the pulley.[1,2,18] Although numbers of cases of other CTDs were limited in this series, we suppose that the posture and motion of culling can contribute to LE in the elbow region, while the repetitive motion at the wrist may contribute to a ganglion cyst in the wrist and DQT. The only case of trigger thumb may have been related to both the repetitive thumb flexion and local contact stress from the "iron nail" tool. Due to the DQT and trigger thumb developing on the left side, their less skillful left hand may have been the aggravating factor in that right-handed culler.

Some controversy continues over whether to place low-back pain in the category of CTD. Vibration was found to be associated with the onset of lumbar disk disease,[2] and the concept that prolonged poor sitting or standing posture when working is relevant to MLBP is widely accepted. Because the present study excluded patients exhibiting symptoms lasting less than 3 months and those that were acute-injury related, MLBP in this study may have been posture-related. Therefore, MLBP was categorized under CTD. On the other hand, spondylosis is usually viewed as a degenerative disease, although repetitive or prolonged neck rotation, flexion/extension, and tilting may precipitate osteophyte formation in the cervical spine, while repetitive lumbar flexion/extension and heavy axial loading may cause degeneration of the lumbosacral spine. The plain films of several patients with low-back pain in this study showed findings of obvious intervertebral space narrowing, although all were accompanied by osteophytes to some degree. These patients were therefore grouped under spondylosis rather than disk disease.

Ergonomics

The ergonomics of betel pepper leaf culling mainly consist of long-term shoulder flexion overhead, elbows extended with pronation, and repetitive wrist and finger flexion. In addition, the "iron nail" could develop local contact stress on the flexor tendon of the thumb while it is being used to cut the leaf-stalk. All these elements are risk factors for CTDs. The prolonged static posture in the shoulder region (a cycle consisting of 46 s of culling and 6.5 s of pausing) appears ergonomically significant, as did the modest to rapid repetitiveness of wrist and finger flexion (0.48 Hz for the dominant hand and 0.28 for the non-dominant hand). These impressions gained from observation of photographs and videotapes are compatible with the finding that the SIS and CTS were the only disorders with statistically higher proportions among the culler group than in the non-culler group. Betel pepper culling should be classified as job category II (low force/high repetition) according to the criteria described by Silverstein et al.[23] In recent studies, however,[24-26] controversy continues about the relationship between CTDs and the levels of force and repetition of a task.

Risk Factors for CTDs

Correlation analysis showed that the CTDs were significantly correlated with total hours employed. This result suggests that CTDs in cullers may be work-related. Conversely, there were no significant correlations between CTDs and patient age, may be due to the age of our patients harrowly ranged within 40 to 64 years. Many studies also found a trend of longer employment (more exposure) leading to more CTDs.[2,16,25,27] In the present study, the r values were not high, corresponding to the low coefficient of determination ($r^2 = 0.3819$). This fact implies that the

etiologies of CTDs in betel pepper cullers are multifactorial. Some of the literature has also reported increased risks of developing occupational CTDs when old trauma, depressive symptoms, and low socioeconomic status are present.[7,16,28,29] Some authors stated that the risk of CTDs increases with age.[24] Some studies revealed that female workers carried greater risk of developing CTDs.[4,30] Hand dominance was noted to be associated with many MSDs of the upper extremities.[18] The present study also revealed a trend of more CTDs in the dominant hand, in both the culler and non-culler groups. No statistical analysis was performed, however, due to the limited case numbers.

Ultrasonography

Although high-resolution ultrasonography is a convenient, noninvasive, and inexpensive tool for diagnosing and staging many MSDs; its accuracy is reader-dependent. Only 1 case report applied ultrasonography to investigate and follow-up occupational CTDs (CTS) by clinical stages.[31] High-resolution ultrasonography offers high sensitivity and specificity in diagnosis of rotator cuff tears, especially for full-thickness tears.[11] The sonographic findings of SIS also correlated well with Neer's stages.[11,18] Otherwise, ultrasonography provides greater sensitivity than plain films for diagnosing calcific tendinitis in the shoulder.[11]

During the last 10 years, the diagnostic accuracy of CTS by high-resolution ultrasonography has considerably developed. A reliable diagnosis of CTS can be made sonographically mainly based on an increase in the cross-sectional area of the median nerve at the level of the pisiform or hamate bone,[8] compatible with nerve swelling at the proximal part of the carpal tunnel. Diagnostic accuracy ranged from 0.68 to 0.92 depending on the criteria.[8] The accuracy would further improve if some other criteria were added, such as the flattened ratio of the median nerve, bowing of the transverse carpal ligament, and compression signs of the median nerve on a longitudinal scan.[8,15] Conflict remains in reports on the relationship of nerve swelling with both electrophysiologic studies and clinical severity.[15,32] Ultrasonography was the only appropriate laboratory examination for diagnosing CTS in this local, primary care hospital where electrophysiologic study equipment was unavailable. In the present study we chose the diagnostic criterion of CTS owing to its high sensitivity (89.1%) and specificity (98.0%).[15]

In conclusion, the proportions of occupational SIS and CTS were higher among the betel pepper leaf cullers than among patients with other occupations. These CTDs may have resulted from the prolonged static posture and repetitive motions while culling. Further study with larger case numbers may be required to quantify the ergonomics and risk factors and to elucidate strategies of prevention and treatment of occupational CTDs in betel pepper cullers.

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復健門診之菱葉採摘者的重複傷害疾患：台東經驗

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背 景： 菱葉栽培是台東重要的農業，採摘菱葉需要許多人力，此病例研究在比較菱葉採摘者與非採摘者的重複傷害疾患之比率。

方 法： 收集台東某地區醫院復健科門診中有肌肉骨骼疾患的病人。女病人分爲採摘者組（菱葉採摘者 20 人）與非採摘者組（其他職業 47 人）。三位採摘者受訪問且攝影工作實景，病人經檢查並以 X 光素片與超音波診斷。

結 果： 採摘時站立雙肩屈曲過頭且內旋，手肘伸展旋前，手腕與手指屈曲，並在拇指上套用工具（鐵指甲）。採摘者的肩夾擠症候群和腕隧道症候群比率明顯高於非採摘者（分別爲 0.45 vs 0.15, $p = 0.011$; 0.40 vs 0.06, $p = 0.002$）。此外，重複傷害疾患的總和也與工作時間呈線性相關。

結 論： 菱葉採摘者的肩夾擠症候群和腕隧道症候群之比率高於其他職業。這些重複傷害疾患可能導因於採摘時長時間固定姿勢與重複動作。

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關鍵字： 重複傷害疾患，職業傷害，超音波，肩夾擠症候群，腕隧道症候群。

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