Incidence and Reappraisal of Known Risk Factors Associated With Carpal Tunnel Syndrome: A Nationwide, 11-Year, Population-Based Study in South Korea

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INTRODUCTION

Carpal tunnel syndrome (CTS) is the most common compressive neuropathy of the upper extremities. The prevalence of CTS in the general population has been estimated to range from 1% to 6%. This variation in the prevalence may be attributable to differences in diagnostic criteria, study designs, and population groups. Although CTS has been studied extensively, its pathophysiology is still not fully understood. Several previous studies have revealed associations between CTS and various risk factors such as being middle-aged and female and having a high body mass index (BMI), diabetes mellitus (DM), rheumatoid arthritis (RA), gout, end-stage renal disease (ESRD), hypothyroidism, Raynaud’s syndrome (RS), certain occupations, trigger finger, computer use, acromegaly, excessive alcohol consumption, and smoking. However, studies that have analyzed the risk factors for CTS have all involved small numbers of participants.

This study used the National Health Insurance Service (NHIS) system of Korea, which covers the entire Korean population, to assess a national-scale population cohort without the limitations of small sample sizes. This study aimed to calculate the incidence of CTS and reappraise the associated risk factors found in previous studies. This information will be helpful for determining the pathophysiology of CTS and hence aid the establishment of effective new public health policies.
selective bias. The purpose of this study was to identify the actual risk factors for CTS from among various known risk factors using data obtained from an 11-year, longitudinal, population-based cohort.

**METHODS**

**Study cohort and database**

We analyzed data that had been added to the NHIS-National Health Screening (NHIS-HealS) cohort9 between 2002 and 2013. The NHIS-HealS cohort comprised 514,866 health-screening participants who represented a random selection of 10% of all health-screening participants who were aged from 40 years to 79 years in 2002 and 2003. The results of the health screenings were used as baseline data. The NHIS-HealS database contains demographic factors such as age, sex, and income-based insurance contributions (a proxy for income), as well as data on the use of medical facilities, including disease classification codes of the Korean Standard Classification of Diseases as modified from those in the tenth revision of the International Classification of Diseases (ICD-10), medical treatment, medical history, and prescriptions. The participants were followed up for 11 years until the end of 2013, unless health services ended owing to death or emigration.

**Study participants**

We formed a subcohort of the NHIS-HealS cohort comprising those who did not die during the study period and thus were fully followed. From the NHIS-HealS cohort we collected patients with newly diagnosed CTS based on the following ICD-10 codes from January 2002 to December 2013: carpal tunnel syndrome (G56.00), carpal tunnel syndrome in an unspecified upper limb (G56.01), carpal tunnel syndrome in the right upper limb (G56.02), and carpal tunnel syndrome in the left upper limb (G56.03). We then established a 1-year washout period by excluding cases identified within the first year in order to confirm newly identified cases of CTS. To enhance the diagnostic validity, we defined that electrodiagnostic studies were performed when there were upper limb electrodiagnostic study codes (F6111, F6121, F6122, and FA111) in NHIS claims data. We only included patients who were newly registered with CTS diagnostic codes within 6 months of conducting electrodiagnostic studies. This approach meant that all of the subjects included in this study had been electrodiagnostically confirmed as CTS. Also, other diseases with a possibility of being confused with CTS or combined diseases with CTS were excluded based on diagnostic codes such as cervical radiculopathy (M50.1), plexopathy (G55.1), and polyneuropathy (G60–G64).

**Selection and measurement of the risk factors for CTS**

We reappraised the known risk factors for CTS by selecting the following variables: sex, age, BMI, and the ICD-10 codes for DM (E.10, E.11, E.12, E.13, and E.14), RA (M.05 and M.06), gout (M.10), ESRD (N.18), hypothyroidism (E.031, E.032, E.038, and E.039), and RS (I.730). BMI was calculated as the weight in kilograms divided by the square of the height in meters, and classified the values into the following five categories based on the Asian standard: <18.5 kg/m² (underweight), 18.5–22.9 kg/m² (normal), 23.0–24.9 kg/m² (overweight), 25.0–29.9 kg/m² (moderate obesity), and 30.0–35.0 kg/m² (severe obesity). To avoid confusion, we only included cases where medical comorbidities had already occurred before a CTS diagnosis.

**Statistical analysis**

The baseline characteristics of the group identified as having CTS (CTS group) vs. the group without CTS (non-CTS control group) are expressed as numbers and percentages in Table 1. Fisher’s exact chi-square test was used to compare the distributions of baseline demographic characteristics and co-morbidities between the groups. Associations between a CTS diagnosis and potential risk factors were assessed using univariate analyses. Variables for which \( p < 0.05 \) in the univariate analyses were included in the subsequent multivariate analysis with a Cox proportional-hazards regression model. A significance cutoff of 0.05 was set.

The standardized incidence of CTS was calculated from the crude incidence using the following formula after correcting for demographic bias in this cohort relative to the national population structure [using the 2005 Korean census population and the World Health Organization (WHO) World Standard Population as a reference]:

\[
\text{Crude incidence} = \frac{\text{Number of cases}}{\text{Total observation person-years} \times 100,000},
\]

\[
\text{Standardized incidence} = \sum P_i \times I_i,
\]

where \( P_i \) is the proportion in each age/sex group relative to the national population, and \( I_i \) is the incidence in each age/sex group for the cohort population.

The statistical package SAS for Windows (version 9.2, SAS Institute, Cary, NC, USA) and R software (version 3.6.0, the R Foundation for Statistical Computing, Vienna, Austria; http://www.r-project.org) were used to create the figures in this study.
Table 1. Characteristics of the CTS and non-CTS control populations

| Age at the start of the study (in 2003), years | CTS (n=7,258) | Non-CTS (n=469,328) | p    |
|-----------------------------------------------|---------------|---------------------|------|
| 40–49                                         | 3,570 (49.19) | 207,467 (44.21)     | <0.0001* |
| 50–59                                         | 2,334 (32.16) | 130,960 (27.90)     |      |
| 60–69                                         | 1,156 (15.93) | 95,445 (20.34)      |      |
| ≥70                                           | 198 (2.73)    | 35,456 (7.55)       |      |

| Sex                                           |               |                     |      |
|-----------------------------------------------|---------------|---------------------|------|
| Male                                          | 1,668 (22.98) | 263,018 (56.04)     |      |
| Female                                        | 5,590 (77.02) | 206,310 (43.96)     |      |

| Body mass index at the start of the study (in 2003), kg/m² | <0.0001* |
|-----------------------------------------------------------|----------|
| <18.5                                                      | 75 (1.03) | 11,390 (2.43)       |
| 18.5–22.9                                                  | 2,166 (29.84) | 168,177 (35.83)     |
| 23.0–24.9                                                  | 2,003 (27.60) | 127,586 (27.18)     |
| 25.0–29.9                                                  | 2,698 (37.17) | 149,293 (31.81)     |
| 30.0–35.0                                                  | 316 (4.35)  | 12,882 (2.74)       |

| Comorbidities                                            |                  |                     |      |
|----------------------------------------------------------|------------------|---------------------|------|
| Diabetes mellitus                                        | 963 (13.27)      | 60,516 (12.89)      | 0.3456|
| Rheumatoid arthritis                                     | 647 (8.91)       | 22,671 (4.83)       | <0.0001*|
| Gout                                                      | 88 (1.21)        | 6,408 (1.37)        | 0.2649|
| End-stage renal disease                                  | 14 (0.19)        | 1,271 (0.27)        | 0.2039|
| Hypothyroidism                                            | 121 (1.67)       | 4,918 (1.05)        | <0.0001*|
| Raynaud’s syndrome                                       | 12 (0.17)        | 284 (0.06)          | 0.0004*|

Data are presented as n (%).<sup>*</sup>

Factors associated with CTS

The CTS group had significantly higher proportions of females (77.02% vs. 43.96%, p<0.0001) and middle-aged subjects (40–49 years: 49.19% vs. 44.21%, p<0.0001; 50–59 years: 32.16% vs. 27.90%, p<0.0001) than the control group. Moreover, the CTS group had significantly higher proportions of overweight (BMI=23.0–24.9 kg/m²: 27.60% vs. 27.18%, p<0.0001), moderately obese (BMI=25.0–29.9 kg/m²: 37.17% vs. 31.81%, p<0.0001), and severely obese (BMI ≥30.0 kg/m²: 4.35% vs. 2.74%, p<0.0001) subjects. Furthermore, subjects with RA (8.91% vs. 4.83%, p<0.0001), hypothyroidism (1.67% vs. 1.05%, p<0.0001), and RS (0.17% vs. 0.06%, p=0.0004) were more prevalent in the CTS group than in the non-CTS control group. However, the proportions of subjects with DM, gout, and ESRD did not differ significantly between the CTS and control groups (Table 1).

Hazard ratios of known risk factors for CTS

Univariate and multivariate Cox analyses of clinical variables and the incidence of CTS were used to investigate the risk factors for newly diagnosed CTS. In univariate analyses, being aged ≥60 years lowered the risk of CTS [hazard ratio (HR)=0.723, 95% CI=0.675–0.771, p<0.0001 for 60–69 years; HR=0.348, 95% CI=0.302–0.402, p<0.0001 for ≥70 years]. In contrast, the risk of CTS was higher in females (HR=4.313, 95% CI=4.083–4.555, p<0.0001) and in subjects with higher BMI (HR=1.994, 95% CI=1.544–2.447, p<0.0001 for BMI=18.5–22.9 kg/m²; HR=2.367, 95% CI=1.880–2.981, p<0.0001 for BMI=23.0–24.9 kg/m²; HR=2.725, 95% CI=2.167–3.428, p<0.0001 for BMI=25.0–29.9 kg/m²; HR=3.710, 95% CI=2.884–4.771, p<0.0001 for BMI ≥30.0 kg/m²), RA (HR=1.932, 95% CI=1.783–2.095, p<0.0001), hypothyroidism (HR=1.611, 95% CI=1.346–1.928, p<0.0001), and RS (HR=2.718, 95% CI=1.543–4.787, p=0.0005) (Table 2). Fig. 3 shows the cumulative incidence rates of CTS based on age, sex, BMI, and each risk factor including RA, hypothyroidism, and RS that showed significant intergroup differences in the univariate analyses.

The multivariate Cox proportional-hazards model included potential risk factors that had been identified by univariate
Analyses. Using backward elimination, being aged \( \geq 60 \) years lowered the risk of CTS (HR=0.590, 95% CI=0.551–0.631, \( p<0.0001 \) for 60–69 years; HR=0.312, 95% CI=0.270–0.360, \( p<0.0001 \) for \( \geq 70 \) years), while the risk of CTS was higher in females (HR=4.429, 95% CI=4.190–4.682, \( p<0.0001 \)) and in subjects with higher BMI (HR=1.604, 95% CI=1.274–2.020, \( p<0.0001 \) for BMI=18.5–22.9 kg/m\(^2\); HR=2.089, 95% CI=1.658–2.630, \( p<0.0001 \) for BMI=23.0–24.9 kg/m\(^2\); HR=2.451, 95% CI=1.948–3.084, \( p<0.0001 \) for BMI=25.0–29.9 kg/m\(^2\), HR=2.728, 95% CI=2.120–3.510, \( p<0.0001 \) for BMI \( \geq 30.0 \) kg/m\(^2\)), RA (HR=1.543, 95% CI=1.421–1.674, \( p<0.0001 \)), and RS (HR=2.273, 95% CI=1.289–4.007, \( p=0.0045 \)) (Table 2).

**DISCUSSION**

CTS is one of the most common entrapment neuropathies, which has prompted numerous investigators to attempt to identify its risk factors. We reappraised the known risk factors identified in previous small-scale studies by using a nationwide-population-based cohort. This study has revealed that some of the known risk factors (age, sex, BMI, RA, and RS) increase the risk of CTS.

**Total incidence of CTS**

The incidence of CTS in this study (130.8/100,000 person-years standardized by the WHO World Standard Population) was lower than those found in previous studies that used clinically diagnosed CTS groups (105–544.12/100,000 person-years). These discrepancies are due to differences in search settings. The reported incidence is naturally higher for clinically diagnosed than electrophysiologically diagnosed CTS. To increase the specificity of the diagnoses, we only included patients with CTS who had undergone electrodiagnostic studies within the previous 6 months, and excluded patients with concurrent radiculopathy, plexopathy, or polyneuropathy. Excluding the study conducted in Italy by Mondelli et
Table 2. Results of univariate and multivariate regression analyses of carpal tunnel syndrome

|                        | Univariate | Multivariate (full model) | Multivariate (reduced model) |
|------------------------|------------|---------------------------|-------------------------------|
|                        | HR 95% CI  | p                          | HR 95% CI                     | p                           |
| Age at the start of the study (in 2003), years |            |                           |                               |                             |
| 40–49                  | Ref.       |                           | Ref.                          | Ref.                        |
| 50–59                  | 1.047      | 0.994–1.103               | 0.0846                        | -                           |
| 60–69                  | 0.722      | 0.675–0.771               | <0.0001*                      | 0.590                       | 0.551–0.632                 | <0.0001*                     |
| ≥70                    | 0.348      | 0.302–0.402               | <0.0001*                      | 0.312                       | 0.270–0.360                 | <0.0001*                     |
| Sex                    |            |                           |                               |                             |
| Male                   | Ref.       |                           | Ref.                          | Ref.                        |
| Female                 | 4.313      | 4.083–4.555               | <0.0001*                      | 4.431                       | 4.192–4.685                 | <0.0001*                     |
| Body mass index at the start of the study (in 2003), kg/m² |            |                           |                               |                             |
| <18.5                  | Ref.       |                           | Ref.                          | Ref.                        |
| 18.5–22.9*             | 1.994      | 1.544–2.447               | <0.0001*                      | 1.604                       | 1.274–2.019                 | <0.0001*                     |
| 23.0–24.9*             | 2.367      | 1.880–2.981               | <0.0001*                      | 2.088                       | 1.658–2.629                 | <0.0001*                     |
| 25.0–29.9*             | 2.725      | 2.167–3.428               | <0.0001*                      | 2.450                       | 1.947–3.083                 | <0.0001*                     |
| 30.0–35.0*             | 3.710      | 2.884–4.771               | <0.0001*                      | 2.726                       | 2.119–3.508                 | <0.0001*                     |
| Comorbidities          |            |                           |                               |                             |
| Diabetes mellitus      | 1.041      | 0.972–1.114               | 0.2510                        | -                           |
| Rheumatoid arthritis   | 1.932      | 1.783–2.095               | <0.0001*                      | 1.540                       | 1.418–1.673                 | <0.0001*                     |
| Gout                   | 0.888      | 0.719–1.095               | 0.2665                        | -                           |
| End-stage renal disease| 0.715      | 0.423–1.207               | 0.2090                        | -                           |
| Hypothyroidism         | 1.611*     | 1.346–1.928               | <0.0001*                      | 1.049                       | 0.876–1.256                 | 0.6064                       |
| Raynaud’s syndrome     | 2.718*     | 1.543–4.787               | <0.0001*                      | 2.267*                      | 1.286–3.996                 | 0.0047                       |

*p<0.05.
CI: confidence interval, HR: hazard ratio, Ref.: reference.

Fig. 3. Cumulative incidence rates of carpal tunnel syndrome based on age, sex, body mass index, and each risk factor including RA, hypothyroidism, and RS that showed significant differences in the univariate analyses (see Table 2). RA: rheumatoid arthritis, RS: Raynaud's syndrome.
| Country, authors | Study location, period | Study design | Method of CTS diagnosis | Incidence of CTS (per 100,000 person-years) | Peak age of CTS |
|------------------|-----------------------|-------------|-------------------------|-------------------------------------------|----------------|
| United States, Stevens et al. | Rochester, 1961–1980 | Rochester Epidemiology Project | Clinical or electrodiagnostic CTS (diagnostic codes in database) | 105 | Males: increased with age  
Females: 45–54 years |
| United States, Nordstrom et al. | Marshfield, 1991–1993 | Wisconsin HMO database | Clinical or electrodiagnostic CTS (diagnostic codes in database and chart review) | 346 | Males: >65 years  
Females: 50–64 years |
| Italy, Mondelli et al. | Siena, 1991–1998 | Data from local neurophysiological center | Electrodiagnostic CTS | Crude: 329 (WHO Standardized: 276)  
Males: 139  
Females: 506 | Males: 50–59 and 70–79 years (bimodal distribution)  
Females: 50–59 years |
| Italy, Mattioli et al. | Tuscany, 1997–2000 | Discharge records from all hospitals (hospital data) | Clinical CTS | WHO Standardized: 106  
Males: 44  
Females: 166 | Males: 70–79 years  
Females: 50–59 years |
| Netherlands, Bongers et al. | Whole population, 1987–2001 | Dutch national survey of general practice | Clinical or electrodiagnostic CTS | 1987: 130  
2001: 180 | 1987: 25–44 years  
2001: 45–64 years |
| United Kingdom, Bland and Rudolfer | East Kent and Huddersfield, 1991–2001 | Data from local neurophysiological center | Electrodiagnostic CTS | 104  
Males: 67  
Females: 139 | 50–64 and 75–84 years (bimodal distribution) |
| United States, Gelfman et al. | Olmsted County, 1981–2005 | Rochester Epidemiology Project | Clinical or electrodiagnostic CTS (diagnostic codes in database) | 376 | Males: 70–79 years  
Females: 50–59 years |
| Sweden, Atroshi et al. | Skane County, 2003–2008 | Skane Health Care Register (covers all public healthcare providers) | Clinical or electrodiagnostic CTS | Males: 125  
Females: 324 | Males: 50–59 years  
Females: 50–59 years |
| Taiwan, Tsai et al. | Whole population, 2003–2012 | Taiwan National Health Insurance Research Database | Clinical or electrodiagnostic CTS | 544.12 | Males: 50–59 years  
Females: 50–59 years |
| Korea, current study | Whole population, 2003–2013 | Korea National Health Insurance Service–Health Screening database (age >39 years) | Clinical and electrodiagnostic CTS | WHO Standardized: 130.8 | Males: 50–59 years  
Females: 40–49 years |

CTS: carpal tunnel syndrome, HMO: Health Maintenance Organization, WHO: World Health Organization.
Incidence and Risk Factors of CTS

al. resulted in previously reported incidence rates for electrophysiologically diagnosed CTS of 98–104/100,000 person-years, which are similar to our results (Table 3). Risk factors consistent with previous studies

We found that known risk factors, including being female, being aged 40–59 years, and having a higher BMI, a diagnosis of RA, and a diagnosis of RS were related to the onset of CTS.

It is well known that CTS is more common in females, whose incidence is reportedly two- to fourfold higher than in males. This is consistent with our result of HR=4.429 for the incidence among females of all ages. Also, this study found that the incidence of CTS was highest in females aged 40–49 years and males aged 50–59 years. This sex-related difference could be due to the relative vulnerability of females to CTS, whose incidence peaks at perimenopausal age. It is consistent with the hypothesis that in females there is a hormonal component in developing CTS, possibly involving long-term hormonal effects of pregnancy or a cumulative exposure to female sex hormones. In addition, the physical activity associated with employment, exercise, and housework is usually the most vigorous before middle age.

However, some of the data in Table 3 suggest different age-specific CTS distributions among males. One study conducted in Italy and another in the United Kingdom suggested a bimodal age distribution, with peaks at ages of 50–59 and 70–79 years. Other studies in the United States and Italy showed that the CTS incidence rate gradually increases with age, peaking at >65 or 70–79 years. CTS is also related to the physical workload, and several previous studies have shown that the CTS incidence is higher in rural and industrial areas than in the urban areas. This means that there could be an effect of occupation and physical work intensity on the incidence of CTS, especially in males. In Korea, there has been a constant movement of people from rural to urban areas over the past few decades, and urban knowledge-based service industries need less physical labor. Furthermore, because accessibility to health care is better in Korea than in most other countries, the associated earlier diagnoses of CTS could affect the results. Also, the relevant socioeconomic and demographic factors may vary with the time, country, or study population, and so further studies of the association between occupation parameters and CTS incidence are necessary.

Table 3 shows that the highest incidence rates were found in rural agricultural areas. This difference could be due to the relative vulnerability of females to CTS, possibly involving long-term hormonal effects of pregnancy or a cumulative exposure to female sex hormones. In addition, the physical activity associated with employment, exercise, and housework is usually the most vigorous before middle age.

Risk factors differing from previous studies

DM is a well-known risk factor for CTS. Previous studies have found that CTS is present in up to one-third of patients with DM and is three times more prevalent in diabetic than healthy populations. DM is a well-known risk factor for CTS. Previous studies have shown that patients with DM had the highest risk of diabetic hand syndromes, including CTS. However, the research method used in our study meant that it did not directly address the relationship between DM and the occurrence of CTS. We only included participants with CTS diagnosed electrodiagnostically and without radiculopathy, plexopathy, and polyneuropathy. The prevalence of diabetic polyneuropathy increases with the duration and severity of DM. In other words, the present study was highly likely to have excluded many patients with a longer DM duration, and the findings suggest that DM requires some time to affect the occurrence of CTS. This is consistent with a previous study of the NHIS National Sample Cohort finding that patients with DM polyneuropathy had an increased risk of developing CTS over time compared with those without DM polyneuropathy. Similarly, ESRD, a known risk factor for CTS, was less relevant to CTS in the present study. Previous studies have shown that patients with ESRD receiving renal dialysis are likely to develop CTS due to beta-2 microglobulin, which is an amyloid-like deposit in the soft tissue that is similar to gouty tophi. However, uremic polyneuropathy is common in patients with ESRD, although the polyneuropathy is often subclinical and detectable only by electrophysiological studies. Patients with CTS would have been excluded from our study due to those with polyneuropathy being eliminated.
There have been some reports that tophus deposition in the carpal tunnel can lead to CTS. However, our study showed that gout does not increase the risk of CTS development. Despite the space-occupying nature of gouty tophi, a review of the literature showed that CTS secondary to gout is uncommon. This is because gout rarely affects the wrist, and is even more rare when gout is managed.

There is controversy about the effect of hypothyroidism on CTS. One meta-analysis found a modest association between hypothyroidism and CTS, but this may have been due partly to publication bias, as evidenced by an asymmetric funnel plot. An investigation of one million people in Taiwan found that the occurrence of CTS in patients younger than 39 years was related to hypothyroidism, whereas CTS in those older than 40 years was not. Our analysis targeted people older than 40 years, and found no significant relationship between hypothyroidism and CTS in the multivariate analysis.

**Strengths**

This study had several strengths. First, the NHIS-HealS data could be highly representative of the general population aged from 40 years to 79 years in South Korea. Second, the sample was very large, which increased the statistical power of our study. Third, the analyzed database contains nationwide follow-up data with a high coverage rate of the general population, and almost all data in the database are available.

**Limitations**

Our study was subject to some inherent limitations. First, the diagnoses of CTS in our database constituted administrative data rather than clinically ascertained data, and there is a possibility of misdiagnoses of CTS in health insurance claims data. To mitigate this vulnerable aspect of the database, we used the codes for electrodiagnostic studies to complement the disease codes. This enhanced the specificity of the diagnoses and so improved their robustness. Second, we assumed that factors such as the BMI, age groups (40–49, 50–59, 60–69, or ≥70 years), and comorbidities (DM, RA, gout, ESRD, hypothyroidism, and RS) remained unchanged over the time period of this study. It is, therefore, possible that bias from unknown or changed confounders and errors related to inaccurate claims data affected our results. However, this could have been offset by the strength of this big-data study involving a nationwide database based on NHIS claims data. Furthermore, a well-designed prospective randomized controlled study would be necessary to determine the causal relationship. The third limitation is that this study did not include participants younger than 40 years, because national periodic health screening is only offered to people aged ≥40 years. However, it is already known that CTS usually does not occur in people younger than 40 years, and so our study cohort included the more-affected age groups. Fourth, by excluding CTS combined with cervical radiculopathy, plexopathy, or polyneuropathy, the incidence of electrodiagnostic CTS in our study could have been underestimated and thereby have affected the risk factor analysis. However, one of the strengths of this study was its robustness in diagnosing CTS based on electrodiagnostic confirmation. Lastly, the increasing use of ultrasound in diagnosing CTS supplementary to electrodiagnosis might have resulted in underestimation of the incidence of CTS in this study. Future studies that include ultrasound-diagnosed CTS might therefore be necessary.

**Conclusion**

In this study we identified the following risk factors for CTS: being female, being 40–59 years old, and having a high BMI, RA, or RS. However, DM, gout, hypothyroidism, and ESRD were not associated with CTS in this study. We suggest that the results of our study will be helpful in determining the pathophysiology of CTS and the early-stage prevention of CTS.

**Availability of Data and Material**

The datasets generated or analyzed during the current study are available in the NHIS-HealS repository (https://nhiss.nhis.or.kr/bd/ab/bdaba-022Heng.do).

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**Conflicts of Interest**

The authors have no potential conflicts of interest to disclose.

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