Linburg-Comstock: Is Overuse an Etiological Factor?

Le syndrome de Linburg-Comstock : la surutilisation est-elle un facteur étiologique?

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Abstract

Background: Linburg-Comstock anomaly is typically defined as a tenosynovial interconnection between flexor pollicis longus and flexor digitorum profundus tendon of the second finger. There are several studies stating that the current anomaly is congenital or acquired. The aim of this study is to reveal whether overuse, which is mostly reported as an acquired etiologic factor, effective in development of the current anomaly. **Methods:** Three hundred thirteen medical secretaries who work with computer keyboard at least 6 hours a day were defined as study group. Three hundred twenty-three volunteers without jobs who necessitate continuous and repetitive hand and finger activities were defined as control group. All individuals were examined by an orthopaedic surgeon. Additionally, cases with Linburg-Comstock anomaly were evaluated in respect of forearm pain and subjective findings of carpal tunnel syndrome. **Results:** Linburg-Comstock anomaly was determined in 27.8% cases of medical secretary group and in 32.2% of healthy control group. In medical secretaries with Linburg-Comstock anomaly, 25.3% had forearm pain and 5.7% had findings of carpal tunnel syndrome. In control group with Linburg-Comstock anomaly, 21.2% had forearm pain and 13.5% had findings of carpal tunnel syndrome. No relationship was found between overuse of the hand and Linburg-Comstock anomaly and the symptoms accompanying the anomaly. **Conclusions:** The current study reveals that overuse is not an etiologic factor in Linburg-Comstock anomaly existence and related symptoms. We think that the current anomaly develops on congenital basis rather than acquired factors.

Résumé

Historique : En général, le syndrome de Linburg-Comstock désigne une interconnexion ténosynoviale entre le tendon long fléchisseur et le tendon fléchisseur profond de l'index. Selon plusieurs études, cette anomalie est congénitale ou acquise. La présente étude visait à déterminer si la surutilisation, surtout considérée comme un facteur étiologique acquis, contribue à l'apparition de cette anomalie. **Méthodologie :** Les chercheurs ont sélectionné un groupe d'étude composé de 313 secrétaires médicales qui saisissaient des données au moins six heures par jour. Le groupe témoin était formé de 323 volontaires n'occupant pas un emploi exigeant des activités répétitives et continues des mains et des doigts. Un chirurgien orthopédique les a tous examinés. De plus, les chercheurs ont évalué les syndromes de Linburg-Comstock en fonction de la douleur de l'avant-bras et des observations subjectives de syndrome du canal carpien. **Résultats :** Les chercheurs ont constaté la présence d'un syndrome de Linburg-Comstock chez 27,8 % des secrétaires médicales et 32,2 % des sujets du groupe témoin. Chez les secrétaires médicales atteintes de ce syndrome, 25,3 % souffraient de douleurs à l'avant-bras et 5,7 % présentaient des constatations de syndrome du canal carpien. Quant aux sujets du groupe témoin ayant l'anomalie, 21,2 % souffraient de douleurs à l'avant-bras et 13,5 % présentaient des constatations de syndrome du canal carpien. Les chercheurs n'ont remarqué aucun lien entre la surutilisation de la main, le syndrome de Linburg-Comstock et les symptômes connexes. **Conclusions :** La présente étude révèle que la

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surutilisation n'est pas un facteur étiologique du syndrome de Linburg-Comstock et des symptômes connexes. Les auteurs croient qu'il s'agit d'une anomalie congénitale et d'un problème non acquis.

Keywords

Linburg-Comstock, anomaly, overuse, etiologic factor

Introduction

Linburg-Comstock anomaly is often seen in the general population but is less well-known than other upper extremity anomalies. This phenomenon was first described by Linburg and Comstock in 1979 with cadaver dissection and was shown to be an extra-tendinous anatomic interconnection between tendons.¹ In this anomaly, there is typically a tenosynovial interconnection between the flexor pollicis longus (FPL) tendon and the flexor digitorum profundus (FDP) tendon of the index finger. This connection prevents free excursion of the FPL tendon. Active flexion from the interphalangeal (IP) joint of the thumb, independent of other fingers, causes simultaneous flexion of the index finger distal interphalangeal (DIP) joint. Occasionally, this tenosynovial interconnection may be between the FPL tendon and the middle and ring finger FDP tendon.²⁻⁴

Previous studies have reported that this anomaly may be congenital or acquired.^{5,6} Of the acquired etiological factors, the causes held most responsible are overuse, local injuries, forearm cuts, and post-traumatic tenosynovitis.⁷⁻¹⁰

The Linburg-Comstock anomaly rarely leads to symptoms, and therefore, individuals with this anomaly continue with their lives unaware of it. In symptomatic individuals, intermittent pain on the volar surface of the forearm, numbness in the fingers, tingling, and nocturnal pain accompanying findings of median nerve neuropathy may be seen.^{2,3,6,10} In the literature, symptoms have been reported to be related to overuse or incorrect use of the hand and to be aggravated by continuous or repetitive hand and finger activity.^{7,10,11}

The aim of this study was to compare the rates of Linburg-Comstock anomaly seen in the normal population and in a medical secretary population who have intense repetitive and continuous use of their hands and to investigate whether hand overuse was an etiological factor.

Materials and Methods

This retrospective study was approved by the institutional review board of our university.

Examination was made of 550 medical secretaries working in our hospital. This group, composed of medical secretaries, was labelled group 1A. Exclusion criteria for group 1A were using a keyboard for less than 6 hours per day and not using 10 fingers to type. The control group, labelled group 1B, comprised healthy individuals selected from hospital visitors. The exclusion criteria for group 1B were using a keyboard for more than 2 hours per day or undertaking work or a hobby which required continuous and repetitive hand and finger activity

(musician, tailor, cleaner, carpenter, etc). In addition, for both groups, patients were excluded if they had a congenital upper extremity anomaly, a penetrating or non-penetrating injury to the hand, wrist, or forearm; a history of fracture or surgery; arthritis; contracture; or a known history of rheumatismal or collagen tissue disease. After these exclusions, the study finally included 313 medical secretaries and 323 healthy individuals who met the study criteria.

All participants were evaluated by an orthopaedic surgeon. With the wrist and all fingers in full extension, the participant was requested to actively move the tip of the thumb from the metacarpophalangeal and IP joints in flexion toward the palm toward the base of the small finger. Typically, when together with the index finger, one or more fingers came into passive flexion from the DIP joint simultaneously, the test was accepted as positive. By repeating this movement several times, reflex flexion movement was discounted. In addition, the individuals with Linburg-Comstock anomaly were questioned in respect of forearm pain and feelings of discomfort together with subjective findings of carpal tunnel syndrome (CTS; numbness in the fingers, paresthesia, night pain, etc).

The groups were examined in respect of age and gender distribution. Groups 1A and 1B were compared in respect of the presence of Linburg-Comstock anomaly. Evaluation was made as to whether or not continuous and repetitive finger activity had any effect on the incidence rates of this anomaly. Two sub-groups were then formed by separating the individuals with Linburg-Comstock anomaly from both groups. These subgroups were labelled group 2A and group 2B. Comparison was made between the 2 sub-groups in respect of whether there was a difference in the rates of symptoms seen. Evaluation was made of whether continuous and repetitive finger activity had an effect on the rates of symptoms seen in individuals with Linburg-Comstock anomaly.

Statistical Analysis

To evaluate differences between the groups in respect of age distribution, the Mann-Whitney *U* test was used. Gender distribution, presence of Linburg-Comstock anomaly, and rates of symptoms seen were evaluated between the groups with Pearson χ^2 analysis. A value of $P < .05$ was accepted as statistically significant.

Results

Group 1A comprised 229 (73.2%) females and 84 (26.8%) males with a mean age of 33.9 years (range, 19-50 years). Group 1B comprised 227 (70.3%) females and 96 (29.7%) males with a mean age of 33.1 years (range, 18-47 years). No difference was

found between the groups in respect of age and gender distribution ($P > .05$; age, $P = .119$; gender, $P = .420$).

Linburg-Comstock anomaly was determined in 87 (27.8%) cases of group 1A and in 104 (32.2%) of group 1B. No statistically significant difference was determined between groups 1A and 1B in respect of Linburg-Comstock anomaly ($P > .05$; $P = .226$).

Of the 87 medical secretaries in group 1A with Linburg-Comstock anomaly, 22 (25.3%) had forearm pain or discomfort and 5 (5.7%) had findings of CTS. Of the 104 cases in the control group of group 1B with Linburg-Comstock anomaly, 22 (21.2%) had forearm pain or discomfort, and 14 (13.5%) had findings of CTS. No significant difference was determined between groups 2A and 2B in the comparison of symptoms seen ($P > .05$; forearm pain, $P = .499$; CTS findings, $P = .076$).

Discussion

Contrary to assumptions, Linburg-Comstock anomaly is not rare. Miller et al reported that it was seen at a rate of 60% to 70%.¹² In the first prevalence study by Linburg and Comstock, rates were reported of 31% unilateral and 14% bilateral.¹ Rennie and Muller determined a rate of 20% and Low et al determined 35%.^{6,13} In the current study, the anomaly was seen at the rate of 27.8% and 32.2%.

In humans, the FPL and FDP originate phylogenetically from the common mesodermal mass. In advanced life forms, the FPL and FDP have become independent and move separately, whereas in other primates there is only 1 common deep flexor tendon for all digits that also provides a tendon to the thumb.^{14,15} When the Linburg-Comstock anomaly is present, the FPL tendon cannot move independently. A muscular or tendinous interconnection between the FPL and FDP has been shown in cadaver dissections, case reports, and on magnetic resonance imaging.^{1,16-19}

One of the acquired factors which has been held responsible for the emergence of Linburg-Comstock anomaly is continuous or repetitive finger activity. Lombardi et al explained this condition with tenosynovitis occurring due to repetitive traction and irritation. It was reported that restrictive flexor tenosynovitis was caused by adhesions preventing the independent movement of the FPL.¹⁰ In a study by Rennie and Muller, it was reported that no relationship could be found between the anomaly and repetitive activity and adhesive tenosynovitis mechanism.⁶ In the current study, no relationship was determined between continuous and repetitive finger activity and the incidence of Linburg-Comstock anomaly. Conversely, the anomaly was determined at a higher rate in the control group. Thus, it can be considered, as was the conclusion of Rennie and Miller that this anomaly, with the exception of certain specific circumstances, occurs congenitally rather than acquired. Tenosynovitis occurring as a result of overuse of the hand is not considered by the current authors to be one of the acquired factors of this anomaly. In contrast, the anomaly could be considered to create a predisposition to tenosynovitis. That restrictive tenosynovitis develops in

individuals with this anomaly who overuse their hands should be considered a result, not a cause.

The literature on this subject has been seen to focus on specific occupational groups, primarily musicians.^{2,11,12,18,20} For individuals such as musicians, police, and security guards to be able to continue their occupations or to advance in their professions, independent finger movement is very important. Therefore, that they have higher rates of diagnosis can be considered to be due to an increased awareness because of the necessity for continuous and repetitive finger activity in their work or hobby.

Linburg-Comstock anomaly is rarely symptomatic and the most commonly seen symptoms are forearm pain and CTS. The factors associated with the symptoms of this anomaly are unclear, although the most important factors are related to overuse injuries and flexor tenosynovitis.^{2,4,10} Another hypothesis is that anatomical anomalies, including extra tendon slip or muscle bellies, act as space occupying lesions and contribute to cause CTS.³ Karalezli et al and Rennie and Muller in contrast to Linburg and Comstock and Lombardi et al found no association between this anomaly and the presence of CTS.^{1,2,6,10} In the current study, no relationship was determined between continuous and repetitive finger activity and the rate of symptoms seen in individuals with the anomaly. In contrast, although not at a statistically significant level, CTS was seen more in the control group. It is thought that the routine activities maintained in the lives of these individuals with the anomaly are sufficient to form the appropriate conditions for the symptoms to occur. In those with continuous or repetitive finger activity, the severity of the symptoms may be increased. However, in the current study, no definitive evidence was reached which could classify the severity of the symptoms. In future studies, classification would enable data to be clarified.

Declaration of Conflicting Interests

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