順天堂大学大学院スポーツ健康科学研究科 和文抄録
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非特異的慢性腰痛を有する大学生アスリートにおける体幹運動制御能力と筋厚変化の関連

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【目的】
アスリートにおける腰痛の有病率は高く、特に大学生アスリートは高強度かつ頻回なトレーニングが慢性的な腰部負荷を助長し、慢性腰痛のリスクを高める可能性が指摘されている。本研究は非特異的慢性腰痛を有する大学生アスリートを対象に体幹の運動制御能力と腹部体幹筋の筋厚変化率、腰痛と腹部体幹筋の筋厚変化率との左右差の関連を検証することを目的とする。

【方法】
対象は大学生アスリート男女40名とした。適応基準は特異的な病理学的異常所見を認めない腰痛を3ヵ月以上有し、Visual analog scale(VAS)が4以上を非特異的慢性腰痛群、腰痛を3ヵ月以上有しておらず、VASが0を非腰痛群とした。測定項目はSahrmann Core Stability Test（SCST）、腹横筋（TrA）、内腹斜筋(IO)の筋厚変化率とした。超音波測定の検者内信頼性にはICC（1,1）を用いた。群間比較にはSCSTスコアおよびTrA・IO筋厚変化率について，分布特性に応じて対応のないt検定またはMann-Whitney U検定を実施した。群内の左右差の比較には，対応のあるt検定またはWilcoxon符号付順位検定を用いた。SCSTと筋厚変化率の左右差との関連は，スピアマンの順位相関係数で検討し，左右差の指標にはAsymmetry Index（AI）を用いた。

【結果】
本研究における超音波測定の検者内信頼性は高く，TrA筋厚でICC＝0.95，IO筋厚でICC＝0.94を示した。対象者は非特異的慢性腰痛群9例，非腰痛群17例であった。2群間比較では，非特異的慢性腰痛群において左IOの安静時筋厚が非腰痛群より有意に厚かった（$p<0.05$）。一方，その他の安静時筋厚およびSCSTスコアに有意差は認められなかった。筋厚変化率の比較では，右TrAおよび左IOにおいて非特異的慢性腰痛群で有意に低値を示した（$p<0.05$）。また群内比較では，非特異的慢性腰痛群においてTrAおよびIOの筋厚変化率に有意な左右差を認めたが，非腰痛群では左右差を認めなかった。SCSTとTrA・IO筋厚変化率の左右差との関連では，有意な相関関係は認められなかった。

【結論】
大学生アスリートは腹部体幹筋の筋厚変化率の左右差が非特異的慢性腰痛に関連していることが示唆された。

Juntendo University, Graduate School of Health and Sports Science 英文抄録（Abstract）
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Association between trunk motor control and muscle thickness changes in collegiate athletes with nonspecific chronic low back pain

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[Purpose]
Low back pain (LBP) is highly prevalent among athletes. Collegiate athletes in particular are exposed to high-intensity and high-frequency training, which can increase chronic mechanical stress on the lumbar spine and elevate the risk of developing chronic LBP. The purpose of this study was to examine the relationship between trunk motor control, abdominal muscle thickness change rates, and the side-to-side asymmetry of these change rates in collegiate athletes with nonspecific chronic low back pain (NSCLBP).

[Methods]
The study cohort comprised 40 collegiate athletes (male and female). Individuals who reported LBP for more than 3 months without specific pathological findings and had a visual analog scale (VAS) score ≥4 were classified into the NSCLBP group, whereas those who had no LBP for more than 3 months and reported a VAS score of 0 were assigned to the non– LBP group. The assessment items included the Sahrmann Core Stability Test (SCST) and the rate of change in the thickness of the transversus abdominis (TrA) and internal oblique (IO) muscles. Intra-rater reliability of ultrasound measurements was assessed using the intraclass correlation coefficient (ICC [1,1]). Between-group differences in SCST scores and muscle thickness change rates were examined using independent t-test or Mann–Whitney U test, depending on the distribution of the data. Within-group side-to-side comparisons were performed using paired t-tests or Wilcoxon signed-rank tests. The relationship between SCST scores and side-to-side differences in muscle thickness change rates was evaluated using Spearman's rank correlation coefficient, and side-to-side asymmetry was quantified using the Asymmetry Index (AI).

[Results]
Ultrasound measurements demonstrated high intra-rater reliability, with ICC values of 0.95 and 0.94 for TrA and IO, respectively. Nine athletes were allocated to the NSCLBP group and 17 to the non-LBP group. The NSCLBP group exhibited significantly greater resting thickness of the left IO compared with that of the non-LBP group ($p < 0.05$). By contrast, no significant differences were found for other resting muscle thickness measures or SCST scores. Regarding the rate of changes in TrA thickness, the NSCLBP group showed significantly lower values for the right TrA and left IO ($p < 0.05$). Within-group comparisons revealed significant side-to-side differences in thickness change rates of both the TrA and IO in the NSCLBP group, whereas no such asymmetry was observed in the non-LBP group. No significant correlations were identified between SCST scores and side-to-side asymmetry in the TrA or IO thickness change rates.

[Conclusion]
These findings suggest that side-to-side asymmetry in abdominal trunk muscle activation (i.e., the thickness change rate) may be associated with nonspecific chronic low back pain in collegiate athletes.