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Original Research Article

ASSESSING THE IMPACT OF STRENGTH TRAINING ON SHOULDER PATHOLOGY IN ATHLETES

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Abstract: *The prospective study was conducted in Nishtar Medical Hospital Multan, MMDC Multan &FMU Faisalabad from January 2022 to July 2022 to assess the effect of persistent resistance training of the shoulder on undetected pathologies. A total of 10 subjects were included in the study. The participants underwent clinical and radiographic examinations. The clinical assessment also included UCLA, SST, and CMS tests. An experienced radiologist reviewed the MRI images. Analysis showed that the average duration of bodybuilding was 10.6 years. Of the 20 shoulders, 17 (85%) had no pain or limitation, and 3(15%) had mild pain because of recent heavy loading and exercise. All participants had maximum SST scores and UCLA Activity Test for both shoulders. Regarding radiological outcomes, MRI results reported 34 abnormalities. The results show that bodybuilding increase pathologies of AC joint in athletes, though other shoulder complex structures are unaffected.*

Keywords: Resistance training, bodybuilding, shoulder injuries, Magnetic resonance imaging

Introduction

The shoulder is prone to injury due to its anatomical structure (Hadjisavvas et al., 2022). Shoulder injuries, including degenerative disorders and sport-related injuries, are referred for orthopedic and trauma surgery (Beletsky et al., 2022). The shoulder is affected by repetitive motion and changes in sports that primarily involve overhead arm movement and throwing (Beletsky et al., 2022). These changes are asymptomatic in the beginning and cause difficulties at later stages. Resistance training (RT) has been increasingly used; it is recommended for building muscle performance for fitness, rehabilitation, and injury prevention. Though RT has various advantages, it may also be harmful. Both leisure and competitive RT has been associated with injuries (Pirruccio and Kelly, 2019). RT injuries result from losing control while using weights and misusing equipment and can result in adaptive complications (Bonilla et al., 2022). However, the effect of continuous RT on the glenohumeral joint is unknown (Kolber et al., 2017). Data are scarce on this topic. This study aims to assess the effect of persistent resistance training of the shoulder on undetected pathologies. It will help us understand potential causes of idiopathic injuries and pathological changes in shoulder and acromioclavicular (AC) joints. It will also provide information on whether resistance training negatively impacts shoulder morphology and its association with asymptomatic pathologies of the shoulder.

Methodology

The prospective study was conducted in Nishtar Medical Hospital Multan, MMDC Multan & FMU Faisalabad from January 2022 to July 2022. The study included subjects who were athletes and had been bodybuilding for about four years. All subjects undertook 3 bodybuilding sessions every week. Subjects who previously had shoulder pathologies or surgeries were excluded. A total of 10 subjects were included in the study. The informed consent of the participants was recorded. The ethical board of the hospital approved the study. All Patients underwent shoulder examination, which means a total of 20 shoulders were examined. The participants also underwent clinical and radiographic examinations. The participants' mean age, height, and weight were 32.6 years, 177.7cm, and 98.5 kg, respectively. All had been training for 4 years, except 6 participants with more than 9 years of training. Data including BMI, the average duration of the training, and RT

career and previous injuries was recorded through a questionnaire. The questionnaire also included five scales for assessing shoulder pain associated with sports, joint pain, instability during sports, and fear of dislocation and injury. The clinical assessment also included UCLA Activity Test, SST, and CMS (Tashjian et al., 2020; Wilson et al., 2020).

All participants underwent radiologists reviewed MRI examination and results. Pathologies including tendinopathy, partial rupture of rotator cuff tendon, complete rupture of rotator cuff tendon, acromioclavicular joint pathologies, long biceps tendon, labrum changes, fatty infiltration of the rotator cuff, humeral tuberosity cysts and glenohumeral osteoarthritis were reviewed according to the method used in a previous study (Barreto et al., 2019).

SPSS version 23.0 was used for data analysis. Data evaluation was done using descriptive data.

Results

The average duration of bodybuilding was 10.6 years. Pain assessment in various categories is summarized in Table I. Mean CMS for the right and left shoulder were 98.2 points and 97.2 points, respectively. Of the 20 shoulders, 17 (85%) had no pain or limitation, and 3(15%) had mild pain because of recent heavy loading and exercise.

Regarding mobility, all participants had a maximum mobility range (Table II). No participant complained of shoulder pain or limitation during sleep or job. Only 1 of 20 (5%) shoulders had minor limitations regarding leisure activities. All participants performed strength measurements and range of motion without restrictions. All participants had maximum SST scores and UCLA Activity Test for both shoulders.

Regarding radiological outcomes, MRI results reported 34 abnormalities (Table III). Joint hypertrophy was detected in 13 (65%) shoulders.

Table I Results of Visual Analogue Scale

	Anxiety and Instability	Shoulder after Sports	Other Joints during Sports	Shoulder during Sports
The total mean score of 20 shoulders	0.4	0.8	0.6	0.5

Table II Overview of Constant Murley Score

	Pain	Activity	Mobility	Strength	Total
The total mean score of 20 shoulders	13.5	19.9	41	24.6	99

Table III Overview of MRI findings

Pathology	Total findings n=20
Tendinopathy	3 (15%)
Partial rupture of the rotator cuff tendon	0 (0%)
Complete rupture of the rotator cuff tendon	0 (0%)
AC joint Hypertrophy	15 (75%)
Osteophytes	6 (30%)
Inflammatory signs	8 (49%)
Long biceps tendon	1 (5%)
Humeral tuberosity cysts	1 (5%)

Discussion

This study was conducted to assess the impact of long-term resistance training on athletes' shoulders. 20 shoulders were assessed, and the risk of shoulder discomfort and degenerative changes in bodybuilding athletes was low. Most of the previous studies have been done to find injuries that were body-building athletes generally sustain. A study by Keogh and Wood, 2017 showed low risk (0.13–0.71 injuries/ year) of injuries during bodybuilding (Keogh and Winwood, 2017). Mainly lumber spine, knee, elbow, and shoulder are affected. Previous studies by Ritsch, 2020 and Fagotti et al., 2021 reported that the upper extremity is affected in 40% of cases (Fagotti et al., 2021; Ritsch, 2020). A study was conducted by Pearson et al., 2020 on injury trends in competitive bodybuilders. The complex shoulder accounts for 37% of reported injuries (Pearson et al., 2020). Another study by Naunton et al., 2020 reported that the most prevalent injury site in RT athletes was the shoulder complex (Naunton et al., 2020). It may be because these athletes do exercises like overhead and shoulder presses, due to which shoulder injuries make up a significant portion of sports-related injuries.

Moreover, unfavorable positioning of shoulders during these exercises makes shoulders vulnerable to

injuries. The shoulder complex, a non-weight-bearing joint, is significantly strained during heavy weightlifting as it becomes a weight-bearing joint because of repeated lifting in unfavorable position. A study by Kolber et al., 2017 show that many training regimes emphasize on muscles whose strength and size increases, while neglect stabilizing muscles thus impeding shoulder function (Kolber et al., 2017). A study conducted by Yamak et al., 2021 concluded that an imbalance in the range of motion and shoulder strength in bodybuilders cause shoulder disorders (Yamak et al., 2021). AC joint is majorly stressed during RT, leading to a disease called distal clavicular osteolysis. Subchondral stress fractures, distal clavicular bone lysis and widening of the AC joint characterize it. A study conducted by Handoll et al., 2022 reported that lower back injuries followed by shoulder injuries are most common in athletes (Handoll et al., 2022). Barreto et al., 2019 conducted a study in which MRI was used to evaluate unilateral shoulder pain (Barreto et al., 2019). The asymptomatic shoulder also underwent MRI along with the affected. Imaging results also showed abnormal findings on the asymptomatic side, which implies that shoulder abnormalities may not have symptoms and clinical relevance. It was recommended that MRI should not be performed without clinical evidence as it is not significant in terms of the joint's health status. Our study found that few tendinopathies occur due to extensive training load, but the AC joint is most frequently affected. There are few limitations of this study. First, it was conducted on small shoulder size. Second, a control group was included for comparative analysis. A larger study with suitable comparison group is recommended for further analysis.

Conclusions

The results show that bodybuilding increase pathologies of AC joint in athletes, though other shoulder complex structures are unaffected.

Conflicts Of Interest

The authors declared no conflict of interest.

References

Barreto, R. P. G., Braman, J. P., Ludewig, P. M., Ribeiro, L. P., and Camargo, P. R. (2019). Bilateral magnetic resonance imaging findings in individuals with unilateral shoulder pain. *Journal of shoulder and elbow surgery* **28**, 1699-1706.

Beletsky, A., Okoroha, K. R., Cabarcas, B., Garcia, G. H., Gowd, A. K., Meyer, J., Vadhera, A. S., Singh, H., Gursoy, S., and White, G. M. (2022). Magnetic Resonance Imaging Findings of the Asymptomatic Shoulder May Impact Performance, Not Future Injury List Placement in Major League Baseball Pitchers. *Arthroscopy, Sports Medicine, and Rehabilitation* **4**, e487-e493.

Bonilla, D. A., Cardozo, L. A., Vélez-Gutiérrez, J. M., Arévalo-Rodríguez, A., Vargas-Molina, S., Stout, J. R., Kreider, R. B., and Petro, J. L. (2022). Exercise selection and common injuries in fitness centers: a systematic integrative review and practical recommendations. *International journal of environmental research and public health* **19**, 12710.

Fagotti, L., Ejnisman, L., Almeida-Santos, M. A., Gurgel, H. M. C., Miyahara, H. d. S., and Pedrinelli, A. (2021). Epidemiology of hip pain in Brazilian bodybuilders. *Acta Ortopédica Brasileira* **29**, 124-126.

Hadjisavvas, S., Efstathiou, M. A., Malliou, V., Giannaki, C. D., and Stefanakis, M. (2022). Risk factors for shoulder injuries in handball: systematic review. *BMC sports science, medicine and rehabilitation* **14**, 1-21.

Handoll, H. H., Elliott, J., Thillemann, T. M., Aluko, P., and Brorson, S. (2022). Interventions for treating proximal humeral fractures in adults. *Cochrane Database of Systematic Reviews*.

Keogh, J. W., and Winwood, P. W. (2017). The epidemiology of injuries across the weight-training sports. *Sports medicine* **47**, 479-501.

Kolber, M. J., Hanney, W. J., Cheatham, S. W., Salamh, P. A., Masaracchio, M., and Liu, X. (2017). Shoulder joint and muscle characteristics among weight-training participants with and without impingement syndrome. *Journal of Strength and Conditioning Research* **31**, 1024-1032.

Naunton, J., Street, G., Littlewood, C., Haines, T., and Malliaras, P. (2020). Effectiveness of progressive and resisted and non-progressive or non-resisted exercise in rotator cuff related shoulder pain: a systematic review and meta-analysis of randomized controlled trials. *Clinical Rehabilitation* **34**, 1198-1216.

Pearson, J., Spathis, J. G., van den Hoek, D. J., Owen, P. J., Weakley, J., and Latella, C. (2020). Effect of competition frequency on strength performance of powerlifting athletes. *The Journal of Strength & Conditioning Research* **34**, 1213-1219.

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Pirruccio, K., and Kelly, J. D. (2019). Weightlifting shoulder injuries presenting to US emergency departments: 2000–2030. *International journal of sports medicine* **40**, 528-534.

Ritsch, M. (2020). Verletzungen und Überlastungsschäden im Kraftsport. *Sports Orthopaedics and Traumatology* **36**, 260-270.

Tashjian, R. Z., Shin, J., Broschinsky, K., Yeh, C.-C., Martin, B., Chalmers, P. N., Greis, P. E., Burks, R. T., and Zhang, Y. (2020). Minimal clinically important differences in the American Shoulder and Elbow Surgeons, Simple Shoulder Test, and visual analog scale pain scores after arthroscopic rotator cuff repair. *Journal of shoulder and elbow surgery* **29**, 1406-1411.

Wilson, K. W., Popchak, A., Li, R. T., Kane, G., and Lin, A. (2020). Return to sport testing at 6 months after arthroscopic shoulder stabilization reveals residual strength and functional deficits. *Journal of shoulder and elbow surgery* **29**, S107-S114.

Yamak, B., YILDIZ, M., Berent, M., Cebi, M., and ELİÖZ, M. (2021). The effect of wrist grip angle on traumatic symptoms in body builders. *ABOUT THIS SPECIAL ISSUE*, 116.