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THE IMPACT OF PLATELET-RICH PLASMA (PRP) INJECTION TECHNIQUE ON THE RANGE OF MOTION AND PAIN LEVELS IN BASKETBALL PLAYERS WITH ROTATOR CUFF INJURIES

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Abstract

The study aimed at employing platelet-rich plasma (PRP) injection as a modern treatment strategy to enhance the range of motion and alleviate discomfort in basketball players with rotator cuff injuries in the shoulder joint. The research sample consisted of five basketball players with rotator cuff injuries in the shoulder joint, with a mean age of 24.55 ± 0.54 years, an average weight of 75.84 ± 9.16 kg, and a mean height of 183.40 ± 5.24 cm. Specialized physicians assessed their injuries. Platelet-rich plasma injections were provided only once, and the athletes were constrained from exercise and from using the afflicted joint for three days following the injection. Subsequently, they contributed to moderate-intensity training for two weeks and returned to the specified training load after three weeks, with watchful nursing of pain and their condition. The shoulder joint's range of motion was evaluated following the guidelines of the American Academy of Orthopedic Surgeons (AAOS), while pain intensity was estimated using a visual analog scale (VAS) containing 10 points. The measurements were gained prior to the injection (pre-test) and six weeks subsequent to it (post-test). The Statistical Package for the Social Sciences (SPSS) was employed to generate the research findings. The study findings indicated that the platelet-rich plasma (PRP) injection method significantly improved the range of motion, alleviated pain levels, and restored shoulder joint function in basketball players, without opposing side effects, and did not obstruct their training schedule.

Keywords: Platelet-Rich Plasma (PRP), Rotator Cuff Injuries, Range of Motion, Musculoskeletal Pain, Basketball Players.

Introduction:

Shoulder joint injuries rank among the most prevalent injuries in numerous sports, particularly those that involve the upper limb, regardless of whether they are team or solo activities. A study indicates that the annual prevalence rate of various shoulder joint injuries is about 12-25 injuries per 1000 cases (Windt et al., 1995). Fares et al. (2020) conducted a study revealing that, of 3090 injuries sustained by baseball players, 511 were associated with the shoulder joint, representing 17% of the total injuries.

In another study, the incidence of shoulder injuries ranged between 12-19% (Shanley et al., 2015), while it ranged between 23-38% in swimming per year (Tooth et al., 2020).

Basketball is characterized by the extensive use of the upper limb in performing its skills, which exposes the shoulder joint to the risk of various types and severities of injuries. Excessive use of the joint may subject it to high-effort injuries.

Although basketball is not considered a collision sport, meaning it is free from strong physical contact, it is characterized by speed and strength, and it causes a high percentage of various injuries (Meeuwisse et al., 2023). One of the review studies conducted on 318 basketball players showed 10 shoulder joint injuries resulting from training and competition (Tooth et al., 2020). In a two-year longitudinal follow-up study, a total

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of 142 athletes sustained 215 injuries, which accounted for 44.7% of the injured players during the two-year study period, with the shoulder joint accounting for 10 injuries (Meeuwisse et al., 2023). Shoulder injuries are also common among NBA basketball players, as 532 injuries were analyzed during the period from 2010 to 2020 (Collins et al., 2023). Another study designated that there were 30 shoulder joint injuries every season in the NBA from 1988 to 2005 (Drakos et al., 2010).

A contemporary and efficacious approach for curing shoulder joint problems is the administration of Platelet-Rich Plasma (PRP) injections, which alleviates pain associated with muscle, tendon, ligament injuries, and osteoarthritis. Platelet-rich plasma creates a biological therapy for diverse muscular and osseous injuries, encompassing tendons, ligaments, cartilage, and bones. The approach comprises eliminating blood from an individual and subsequently reinjecting it after laboratory processing to enhance platelet concentration. (Milano et al., 2019). This blood plasma will be abundant in growth factors (GFs) and cytokines, which have demonstrated efficacy in helping healing by enabling cell migration and proliferation towards the wounded site, as well as inducing angiogenesis (Zhang et al., 2016).

This approach is categorized by its evasion of surgical intervention. This treatment offers frequent medicinal advantages across several domains, since it enables the stimulation and regeneration of injured tissues, hence positioning it as a potential approach in regenerative medicine (Sharun, 2023). While additional study is essential to determine the long-term efficiency of platelet-rich plasma injections, existing studies indicate that it can alleviate pain and stiffness and enhance physical function in patients with knee osteoarthritis (Shahid et al., 2023; BABU et al., 2023). Recent studies specify an uncertain advantage of platelet-rich plasma injections in alleviating shoulder pain, enhancing functionality, and enabling recovery, with few risks. The delivery of platelet-rich plasma appears to entail few anxieties for the patient (Schneider et al., 2018).

The effectiveness of this non-surgical treatment method for rotator cuff tears (shoulder injuries) lies in reducing pain and inflammation and possibly promoting healing, providing a viable alternative to surgical intervention (Shams et al., 2016).

The occurrence of shoulder joint injuries in basketball players requires prompt and guaranteed treatment to ensure the player's return to competition as soon as possible. Traditional treatments have become insufficient, and it has become necessary to explore methods with greater efficacy and impact, especially with the scientific and technological advancements the world has reached. Since injuries are often accompanied by pain, limited range of motion, and decreased strength, which negatively affect the player's performance, as well as hurting psychological factors. And many players may suffer from various injuries during the training season or competitions, including shoulder injuries, which hinder their ability to perform their technical and tactical duties, negatively affecting their performance. And since most shoulder injury treatments tend to follow traditional methods such as local corticosteroid injections or the use of rehabilitation exercises and physical therapies, which have become conventional methods despite their importance and effectiveness, this does not prevent the use of a more effective and impactful method. Accordingly, the importance of researching the use of a new and effective treatment method, as mentioned in the literature for treating rotator cuff tears in the shoulder joint, became evident. These injuries are among the common problems that can cause pain and limit shoulder function (Dolkart et al., 2014). Accordingly, the research aimed to use platelet-rich plasma injections for basketball players with shoulder joint injuries and to determine their effect on the range of motion and pain level.

Method & procedures:

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The research sample contained five basketball players who had rotator cuff injuries in the shoulder joint, averaging 24.55 ± 0.54 years in age, 75.84 ± 9.16 kg in mass, and 183.40 ± 5.24 cm in height. Their injuries were recognized via medical reports from medical valuations conducted by expert physicians.

Platelet-rich plasma injections were provided in accordance with the specified protocol and only once. This involved drawing blood from the patient using a medical syringe (7.5 ml) and placing it in a tube containing an anticoagulant. The tube was then centrifuged to isolate the platelet-rich plasma at a speed of 1300 RPM for 10 minutes. Subsequently, the platelet-rich plasma was centrifuged again at a speed of 2000 RPM for 10 minutes. (Saurav et al., 2022)

Each patient was injected with their blood plasma by a specialized doctor. Afterwards, the patients were instructed not to engage in any physical training and to limit the use of the joint for three days. After that, they could perform light exercises for two weeks, and with the doctor's approval, from weeks three to six, they could return to their normal training efforts, ensuring that there was no pain or that it disappeared within 24 hours of training. Emphasis was placed on stretching and range of motion exercises to restore the joint to its normal state (Can You Exercise After PRP Injection ?).

The range of motion of the shoulder joint was measured based on the American Academy of Orthopedic Surgeons (AAOS) and the adoption of normal ranges for extension (60°), flexion (180°), abduction (180°), and adduction (40°).(Normal ROM values, n.d). The degree of pain was also measured using the visual analog scale (VAS), which consists of 10 points and is a simple and commonly used method for assessing differences in pain intensity (Carlsson, 1983). The measurements were taken before the injection (pre-test) and 6 weeks after it (post-test). The statistical package (SPSS) was used to obtain the research results.

Results:

Table (1) shows the means and standard deviations of the range of motion variables of the shoulder joint and pain levels in the pre-test and post-test results.

Variables	Natural	Unit of measurement	Pre-test		Post-test	
			S	A±	S	A±
Shoulder extension	° 60	degree	40,200	3,701	54,000	3,809
shoulder flexion	° 180	degree	158.00	6,708	174,600	4,561
Shoulder adduction	° 40	degree	29,200	3.114	38,400	2.302
Shoulder abduction	° 180	degree	151,600	4,333	175,000	3,536
Pain level	10	degree	7,200	0.8367	3,400	0.8894

Table (2) shows the difference in means, standard deviation, calculated t-value, and significance of differences for the range of motion variables of the shoulder joint and pain level between the pre-test and post-test results.

Variables	Natural	Unit of measurement	Pre-test		Post-test	
			S	A±	S	A±
Shoulder extension	° 60	degree	40,200	3,701	54,000	3,809
shoulder flexion	° 180	degree	158.00	6,708	174,600	4,561
Shoulder adduction	° 40	degree	29,200	3.114	38,400	2.302

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Shoulder abduction	° 180	degree	151,600	4,333	175,000	3,536
Pain level	10	degree	7,200	0.8367	3,400	0.8894

* Degrees of freedom (5-1=4). Significant at the error level (0.05) if the error level is less than (0.05).

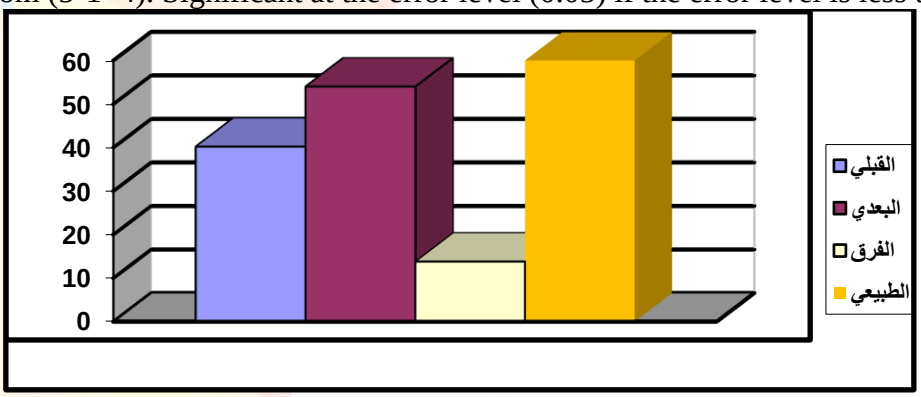

Figure (1) illustrates the arithmetic means and the difference in arithmetic means between the pre-test and post-test results, as well as the normal values for flexion movement.

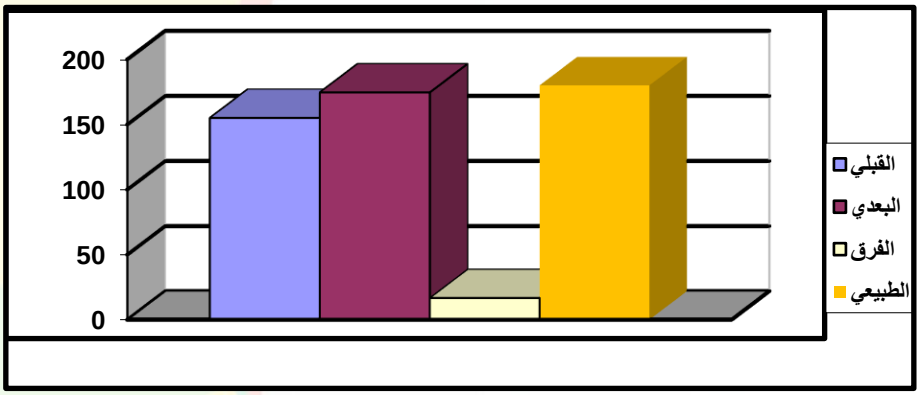

Figure (2) illustrates the arithmetic means and the difference in arithmetic means between the pre-test and post-test results and the normal values for tidal movement.

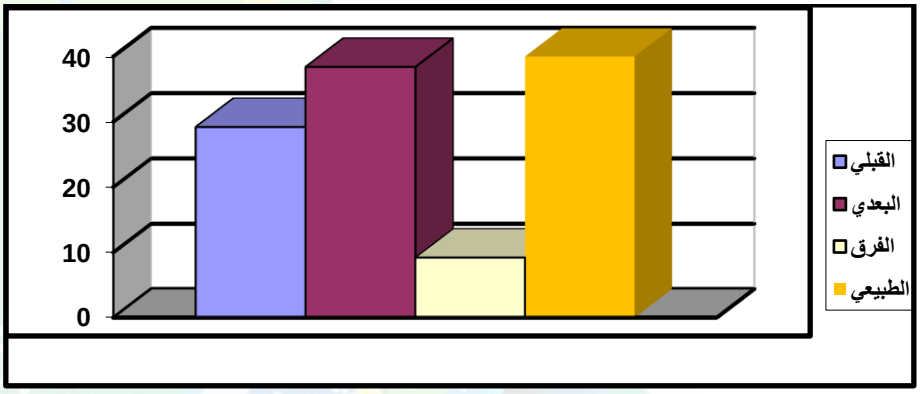

Figure (3) illustrates the means and the difference in means between the pre-test and post-test results and the normal values for shoulder adduction movement.

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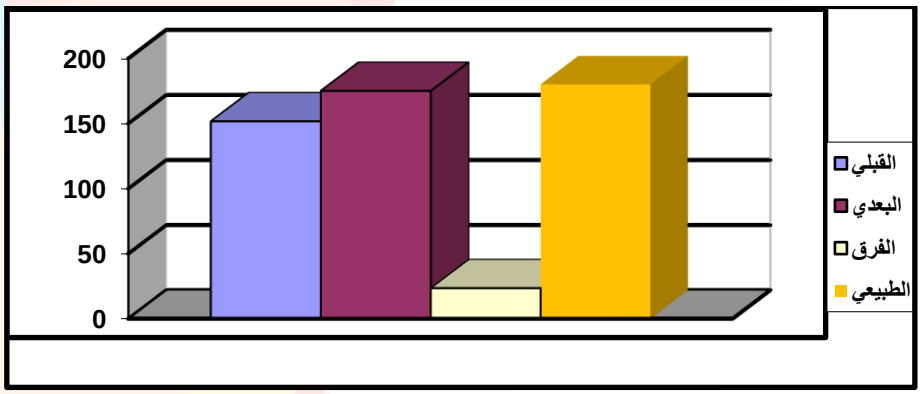

Figure (4) illustrates the arithmetic means and the difference in arithmetic means between the pre-test and post-test results, as well as the normal values for shoulder abduction movement.

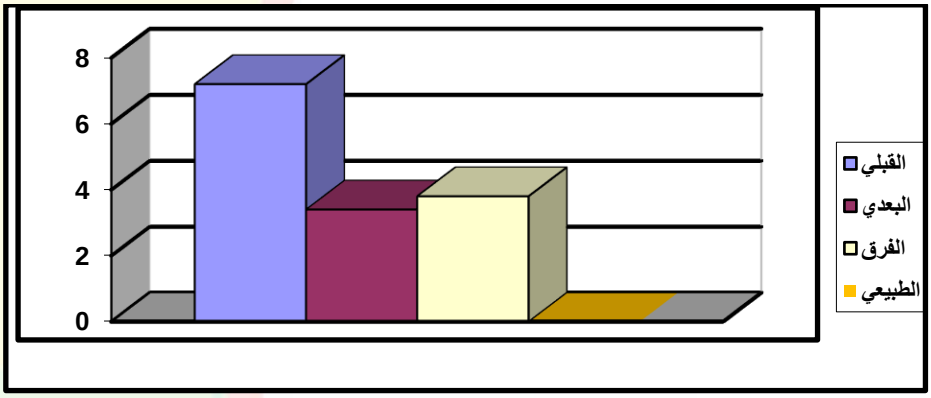

Figure (5) illustrates the arithmetic means and the difference in arithmetic means between the pre-test and post-test results, as well as the normal values for pain levels.

Discussion:

Through Tables 1 and 2, we notice significant differences between the pre-test and post-test results in the four variables of the range of motion specific to the shoulder, serum, and pain level, indicating improvement. Since platelet-rich plasma injections contain a high concentration of growth factors that positively affect damaged tissues by synthesizing collagen, reconstituting blood vessels, and differentiating stem cells into specialized cells, leading to complete recovery from the injury. (Etulain, 2018).

What distinguishes this therapeutic method is its safety, and there are no significant risks associated with its use if applied in a regulated and correct manner (Schneider et al., 2018). Thus, it may serve as an alternative to surgical intervention, in addition to being a therapeutic method with a bright future, as it relies on regenerative medicine in treating sports injuries, including basketball injuries that often occur as a result of training or competition.

Those suffering from rotator cuff injuries typically experience pain and restricted range of motion in the shoulder joint. (Phillips, 2014). This necessitates addressing this issue, as limited movement hinders the execution of basketball skills such as shooting and passing, as well as other offensive and defensive skills. And the conservative treatment of shoulder injuries generally includes the use of therapeutic exercises and

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physical therapy devices, whose effectiveness in treatment cannot be denied. However, plasma injection treatment has significant scientific prospects, and its results indicate its effectiveness.

The results of the research using a single injection were positive and led to a reduction in pain levels and a return of the shoulder's range of motion to very close to normal ranges. This can also be attributed to the regulation of training load after the injection, as the patients did not perform any training in the first three days after the injection, followed by moderate training for two weeks, and then an increase in training load until the sixth week, which saw a decrease in pain during and after training. This is a good indicator of the treatment method used in conjunction with training.

The scientific studies that examined the number of doses administered were varied. The current study agrees with the study by Saurav et al. (2022) in using a single injection, while the studies by Nejati et al. (2017) and Rha et al. (2013) used two injections with an interval of one month (4 weeks). The study by Ilhanli et al. (2015) used three injections with an interval of one week. The previous studies used injections with a volume of (2-6 ml), and the current study did not differ from them, being within the same range with a volume of (4 ml) of platelets.

The rotator cuff injury is considered one of the difficult shoulder injuries to treat due to the complexity of the injury and the involvement of multiple tissues, which may increase the difficulty of managing its treatment and the possibility of it turning into a chronic injury accompanying the basketball player. A study by Mei-Dan & Carmont (2011) indicates that injecting platelet-rich plasma led to reduced pain and improved healing in the injured areas, as well as the restoration of the injured part's function, including the range of motion. A study by Jiménez-Martin et al. (2009) showed improvement in pain and a reduction in the necessary rehabilitation time using platelet-rich plasma injections. The study (Randelli et al., 2011) showed that the use of platelet-rich plasma injections led to improvement in pain and function of the affected rotator cuff joint without any negative side effects.

The aforementioned researches corroborate the findings of the present investigation concerning the efficiency of plasma injections in the cure of rotator cuff problems. The injury restricts movement due to tears and soreness in the area, hence lessening the shoulder's normal functional motion. The instant recovery of the injury results in the alleviation of pain and the repair of the joint's natural range of motion, hence enhancing its mobility and enabling contribution in sports and skill-based activities using the joint.

Conclusion:

- The application of platelet-rich plasma (PRP) injections significantly improves the shoulder joint's range of movement in basketball players.
- The application of platelet-rich plasma (PRP) injections positively impacts the restoration of normal shoulder function in basketball players.
- The application of platelet-rich plasma (PRP) injections proved beneficial in substantially facilitating joint healing for basketball players.
- The application of platelet-rich plasma (PRP) injections demonstrated no opposing outcomes in the cure of rotator cuff injuries among basketball players.
- The application of the platelet-rich plasma (PRP) injection technique did not disturb the training regimen of basketball players as per the established protocol.
- The application of the platelet-rich plasma (PRP) injection technique did not disrupt the training regimen of basketball players as per the recognized protocol.

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