Treatment of Osgood-Schlatter disease in an adolescent athlete with liquid platelet-rich fibrin and heat-coagulated albumin gel: a case report

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ABSTRACT

Background: Knee pain is one of the most frequent musculoskeletal symptoms in young physically active males. In some cases, it is very painful, can be hard to treat, and often leads to heterotopic ossification of the patellar tendon. To the best of our knowledge, there are no reported cases of remission of ossification after clinical intervention.

Case Presentation: A 13-year-old Swedish boy with a 3-year anamnesis of severe Osgood-Schlatter with significant ossification of the patellar tendon at the point of tuberositas tibiae, was treated with injections of liquid platelet-rich fibrin concentrated platelet rich fibrin and heat coagulated albumin platelet rich fibrin gel (ALB-PRF) using a horizontal centrifuge system. He recovered and presented a near complete remission of ossification of the patellar tendon 2 months after treatment and could return to sport after a 3-year break.

Conclusion: This case raises the hypothesis that liquid ALB-PRF gel may be an effective intervention in the treatment of Osgood-Schlatter disease. Further research is required to test this theory.

Keywords: Osgood-Schlatter, PRF, ALB-PRF, PRP.

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Background

Osgood-Schlatter disease (OSD) in children and adolescents is one of the most common causes of anterior knee pain, it is an injury resulting from a traction apophysitis of the tibial tubercle. It is self-limiting and often prevents young athletes from physical activity due to inflammation and pain. Most cases cease with skeletal maturation. Former studies have shown that it mostly occurs in boys at the age of 12-15; however, in more recent studies, no difference in sex distribution can be seen. This may be the result of the increased participation of young females in high-impact sports or the fact that more studies have been published [1].

OSD often causes short periods of pain, forcing the young athlete to take breaks in physical activity and training. In some cases, however, the condition seems to affect more and may force an end to the individual's athletic career. In such cases, orthopedic arthroscopy is considered the golden standard for resolving Osgood-Schlatter lesions [2].

The long-term results after surgery are usually good, with only a few minor postoperative complications known and reoperations are rare [3]. Undergoing surgery is only recommended when conservative treatment has failed and is more common in younger adults [4].

This case highlights a further possible treatment option for Osgood-Schlatter disease resistant to standard treatment options or as an alternative to surgical intervention.

Case Presentation

We present the case of a 13-year-old Swedish boy with a 3-year history of chronic painful Osgood-Schlatter disease with typical ossification and swelling of the patellar tendon at the attachment point of tuberositas tibiae. The condition has made any sporting activities impossible due to severe pain and swelling both during and after physical activity.

Although most cases of OSD recover completely over time when the tibial growth plate closes, some cases have suffered such damage that the lesions and ossification make the recovery difficult. In this case, the 13-year-old boy was experiencing such difficult symptoms that all physical activity was paused for a period of 3 years. The boy was very active and competed and trained in both athletics and football but had to quit both teams due to his OSD. Surgery was discussed and the boy presented clinical symptoms of inflammation and ossification at the point of tuberositas tibiae on the right knee, the diagnosis was confirmed with ultrasound.

Materials and Method

Various types of autologous platelet concentration have been proposed to be used to treat injured tendons and deformations on their attachment. Some studies have indicated a positive effect on inflammation and tendinopathy in general; however, the effect of injected platelets on the injured tendon might require multiple injections and no standard protocols exist [5]. One way of extending the effect of the injected platelets is to heat a liquid platelet-poor plasma layer, the resorption properties of heated albumin (albumin gel) can be extended from 2 weeks to greater than 4 months heat coagulated albumin platelet rich fibrin (ALB-PRF) [6].

Preparation of platelet rich fibrin (PRF) and ALB-PRF

The injured knee of the boy was injected three times during a 1-month period with at least 1 week between the injections. 40 ml blood was collected before each of the three injections. Four 10 ml Plastic, round-bottomed vacuum tubes (Liquid PRF tubes) were used to collect the blood, after collection the tubes were spun on a horizontal swing-out bucket rotors centrifuge system. Two protocols were utilized in the treatment in this case report including a concentrated platelet rich fibrin (C-PRF) protocol of 2,000 × g for 8 minutes and a ALB-PRF protocol of 2,000 × g for 8 minutes followed by a heating and cooling down process before injection was performed. The two protocols were utilized according to previous literature following international guidelines published by Miron et al. [7].

The centrifuge utilized in all three treatments was the Bio-PRF horizontal centrifuge (Bio-PRF, USA).

The first injection was a C-PRF [8] injection of 2 ml, centrifuged at 2,000 × g for 8 minutes. While the two following injections consisted of 2.5 ml of ALB-PRF, 2,000 × g for 8 minutes on a horizontal centrifuge, the albumin layer was heated according to the ALB-PRF protocol: 75 degrees for 10 minutes [9]. In the last step, the heat-coagulated albumin was cooled down to room temperature and mixed with the remaining C-PRF to create ALB-PRF. All injections were performed with ultrasound guidance.

One week after the last treatment, the boy commenced the same rehabilitation exercises he had tried before the intervention (mainly consisting of eccentric training of the knee).

Results

The treated knee was inspected after 1, 2, and 3 months.

The boy presented a significantly lower pain level 3 months after the treatment and no longer had palpation pain when examined around the former painful area at the tuberositas tibiae.

The pain level experienced was assessed using a Verbal Rating Scale (VRS) at rest, while moving and at palpation. The change in experienced pain went from an average of 5 to below 0.33 on the VRS scale 3 months after the treatment. The changes can be seen in Figure 1.

Visually, a significant reduction of the tibial tubercle prominence was observed at the follow-up examinations after the treatment. He returned to sporting activities on an elite level already after 2 months and is still active with no relapses 2 years after the injection treatment.

Discussion

In this case, the patient presented chronic pain, swelling, and ossification of the right patellar tendon, near and at the site of tuberositas tibiae, (which can be clearly seen in Figures 2 and 3) and the diagnosis Osgood-Schlatter was made.

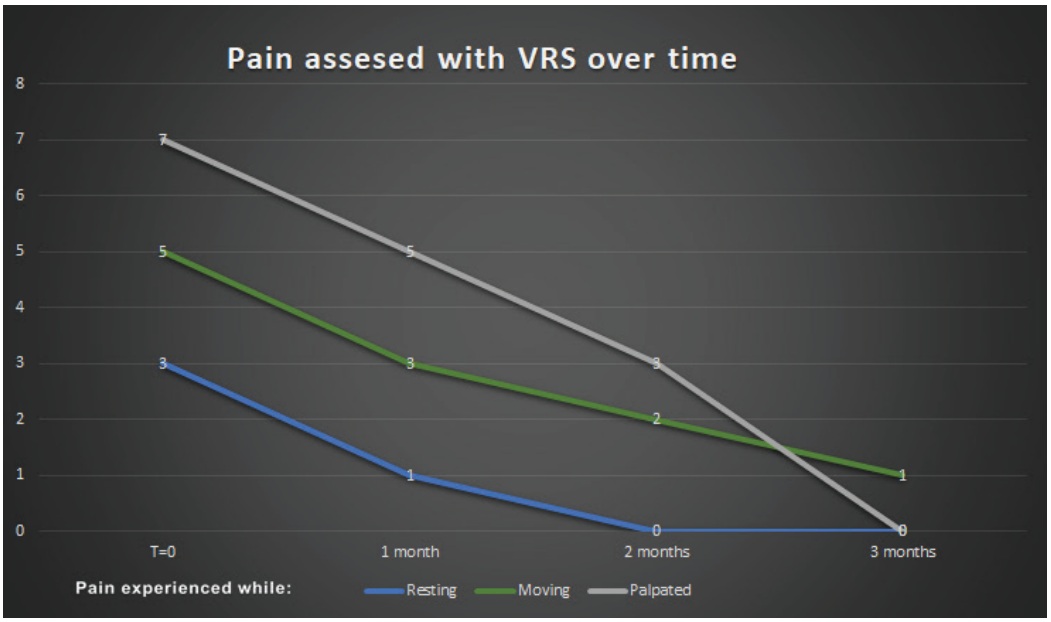

Figure 1. Diagram of the pain experienced, assessed using VRS.

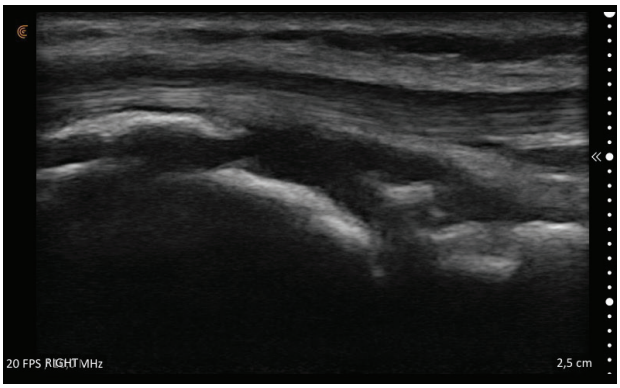

Figure 2. Ultrasound picture of ossification and inflammation of the right knee at the attachment point of the patellar tendon on the tuberositas tibiae.

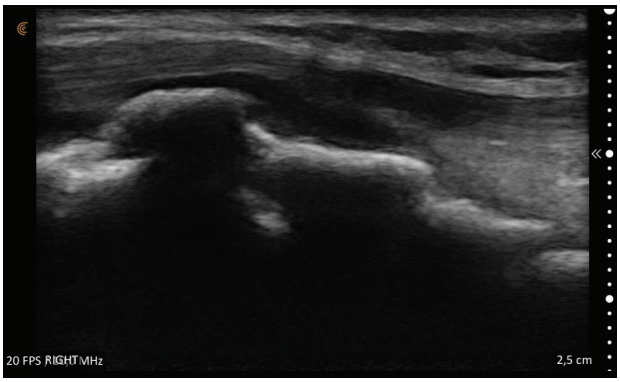

Figure 3. Ultrasound picture of further deformations of the right knee at the attachment point of the patellar tendon on the tuberositas tibiae.

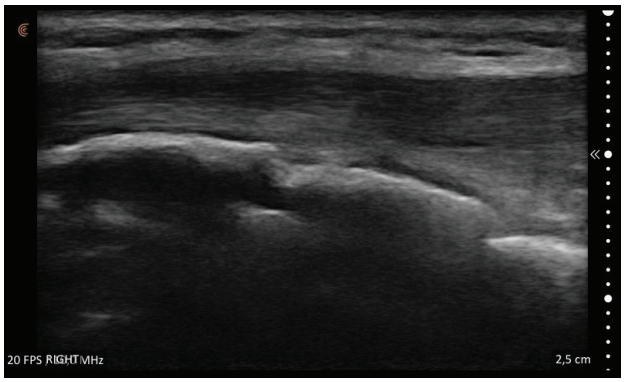

Figure 4. Ultrasound picture of the same right knee, 3 months after the three injections. Fewer deformations and inflammation are visible.

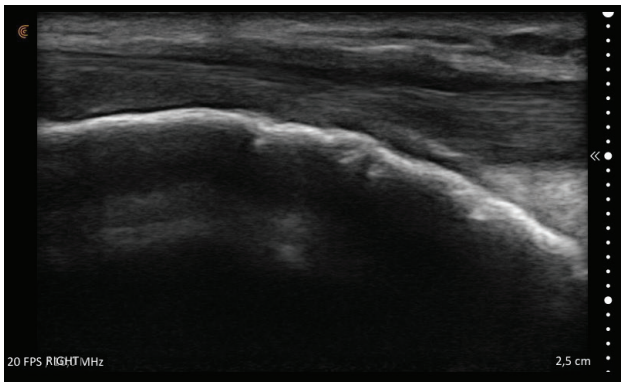

Figure 5. Ultrasound picture of the same right knee from a slightly different angle, 3 months after the three injections. Visibly less ossifications and deformations.

OSD usually resolves with age or conservative therapy (limited physical activity and mild analgesia), although it can be treatment-resistant or reoccurring. The patient in this case was physically active in both athletics and football but had to take longer breaks from his activities, eventually leading to a full stop, thereby he fits the typical profile for OSD but unfortunately also has a small percentage of not recovering after 3 years. The novel PRF and ALB-PRF treatments came after the failure of conventional conservative therapies. Two months after the treatment, he had symptom resolution and could return to sport 1 month later in elite level basketball where he is still active 4 years later. The positive structural changes can be seen in Figures 4 and 5.

In 2017, Danneberg published promising results for the injection of autologous-conditioned plasma (platelets concentrated at 300 g × 5 minutes) in the treatment of tendon injury in OSD [10], the effects, however, on ossification and deformation were absent.

Recent studies have shown that ALB-PRF has a much longer reabsorption time than PRF and other platelet concentrates, leading to the release of growth factors over an extended period of time. In dentistry, it has been used successfully in grafting processes and affects osteogenesis [11]. In animal studies, both solid PRF and Liquid PRF have been shown to hold a potent anti-inflammatory capacity in mesenchymal cells and show the ability to reduce osteoclastogenesis [12,13]. The results presented in this case highlight the possibility that the osteogenic properties of ALB-PRF may have a positive effect on ossification associated with tendon injury where ossification and osteochondrosis appear. A recent review on the subject of ALB-PRF highlighted the great biocompatibility of ALB-PRF and concluded that it has the capacity to greatly enhance fibroblast cellular activity as well as collagen production via the release of blood-derived growth factors [9].

The case presented herein describes a successful novel use of PRF and ALB-PRF for OSD, thus providing us insight into an alternative intervention for patients where the standard conservative treatment has failed or as an option to surgical intervention.

Further research on PRF and ALB-PRF for OSD in a larger patient group is indicated to optimize the treatment protocol further and test the theory in full.

Conclusion

In conclusion, based on the experience of this case and a review of the current specialist literature, we advise that liquid ALB-PRF gel may be an effective intervention

in the treatment of Osgood-Schlatter disease. Further research is required to test this theory.

What is new?

ALB-PRF has the capacity to greatly enhance fibroblast cellular activity as well as collagen production via the release of blood-derived growth factors, this case report presents a novel use to treat ossification associated with tendon injury.

List of Abbreviations

ALB-PRF	Heat coagulated albumin platelet rich fibrin
OSD	Osgood Schlatter disease
PRF	Platelet rich fibrin
VRS	Verbal rating scale

Conflicts of interest

The authors declare that they have no conflict of interest regarding the publication of this case report.

Funding

None.

Consent for publication

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Ethical approval

Ethical approval is not required at our institution to publish an anonymous case report.

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References

1. Ladenhauf HN, Seitlinger G, Green DW. Osgood-Schlatter disease: a 2020 update of a common knee condition in children. Curr Opin Pediatr. 2020 Feb;32(1):107–12. https://doi.org/10.1097/MOP.0000000000000842
2. Circi E, Atalay Y, Beyzadeoglu T. Treatment of Osgood-Schlatter disease: review of the literature. Musculoskelet Surg. 2017 Dec;101(3):195–200. https://doi.org/10.1007/s12306-017-0479-7
3. Pihlajamäki HK, Visuri TI. Long-term outcome after surgical treatment of unresolved osgood-schlatter disease in young men: surgical technique. J Bone Joint Surg Am. 2010 Sep;92(2 Suppl 1 Pt 2):258–64. https://doi.org/10.2106/JBJS.J.00450
4. Achar S, Yamanaka J. Apophysitis and osteochondrosis: common causes of pain in growing bones. Am Fam Physician. 2019 May;99(10):610–8.
5. Le AD, Enweze L, DeBaun MR, Dragoo JL. Current clinical recommendations for use of platelet-rich plasma. Curr Rev Musculoskelet Med. 2018 Dec;11(4):624–34. https://doi.org/10.1007/s12178-018-9527-7
6. Fujioka-Kobayashi M, Schaller B, Mourão CF, Zhang Y, Sculean A, Miron RJ. Biological characterization of an injectable platelet-rich fibrin mixture consisting of autologous albumin gel and liquid platelet-rich fibrin (Alb-PRF). Platelets. 2021 Jan;32(1):74–81. https://doi.org/10.1080/09537104.2020.1717455
7. Miron RJ, Pinto NR, Quirynen M, Ghanaati S. Standardization of relative centrifugal forces in studies related to platelet-rich fibrin. J Periodontol. 2019 Aug;90(8):817–20. https://doi.org/10.1002/JPER.18-0553
8. Fujioka-Kobayashi M, Katagiri H, Kono M, Schaller B, Zhang Y, Sculean A, et al. Improved growth factor delivery and cellular activity using concentrated platelet-rich fibrin (C-PRF) when compared with traditional injectable (i-PRF) protocols. Clin Oral Investig. 2020 Dec;24(12):4373–83. https://doi.org/10.1007/s00784-020-03303-7
9. Miron RJ, Pikos MA, Estrin NE, Kobayashi-Fujioka M, Espinoza AR, Basma H, et al. Extended platelet-rich fibrin. Periodontol 2000. 2023 Nov ;00:1–17. https://doi.org/10.1111/prd.12537
10. Danneberg DJ. Successful treatment of Osgood-Schlatter disease with autologous-conditioned plasma in two patients. Joints. 2017 Aug;5(3):191–4. https://doi.org/10.1055/s-0037-1605384
11. Inchingolo F, Hazballa D, Inchingolo AD, Malcangi G, Marinelli G, Mancini A, et al. "Innovative Concepts and Recent Breakthrough for Engineered Graft and Constructs for Bone Regeneration: A Literature Systematic Review." Materials (Basel, Switzerland) 2022;15(3):1120. https://doi.org/10.3390/ma15031120
12. Kargarpour Z, Nasirzade J, Panahipour L, Miron RJ, Gruber R. Liquid PRF reduces the inflammatory response and Osteoclastogenesis in murine macrophages. Front Immunol. 2021;12:636427. https://doi.org/10.3389/fimmu.2021.636427
13. Kargarpour Z, Nasirzade J, Panahipour L, Miron RJ, Gruber R. Platelet-rich fibrin decreases the inflammatory response of mesenchymal cells. Int J Mol Sci. 2021 Oct;22(21):11333. https://doi.org/10.3390/ijms222111333

Summary of the case

1	**Patient (gender, age)**	Male, 13-year-old
2	**Diagnosis**	Osgood Schlatter disease
3	**Symptoms**	Pain, swelling, stiffness, restriction of movement
4	**Medications (generic)**	-
5	**Clinical procedure**	PRF injections, ultrasound examination
6	**Specialty**	Orthopedics