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Original Research

Role of Physiotherapy in the Treatment of Short Achilles Tendon and Diagnosis by Radiology

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ABSTRACT

This study aims are to investigate the causes, symptoms, and treatment methods for Achilles tendon shortening and its impact on children, specifically. And diagnosed by radiology. The Achilles tendon, also known as the calcaneal tendon, is the largest and strongest tendon in the human body. It is located at the back of the lower leg and connects the calf muscles (gastrocnemius and soleus) to the heel bone (calcaneus). The Achilles tendon plays a crucial role in allowing the foot to flex and point, enabling activities such as walking, running, and jumping. In this study, the data were collected from Orthopedic Department at Tobruk Medical Center and Ml-Malak from Physical therapy clinic in Tobruk, Libya. 14 patients were recorded throughout the year of 2023. But only 6 cases were followed up with physical therapy. The cases were diagnosed by clinical examination

and radiography. One finding implied that the shortening of the tendon may be due unknown causes, or as result cerebral palsy or brain atrophy. he rate of males was greater than the number of females. The percentage of male children was 69% and female children were 31%. Physical therapy plays an important role in treatment. Further studies are needed to confirm this finding.

KEYWORDS: Achilles, Tendon Short, Tobruk Medical Center, Physiotherapy, Rehabilitation, Radiology.

INTRODUCTION

The tendon is named after Achilles, the legendary Greek warrior of the Trojan War, who was believed to have been invulnerable except for his heel. The term "Achilles' heel" has come to represent a person's vulnerability or weak point. Achilles tendon shortening (a condition where the tendon becomes shortened (Britannica, 2024). Achilles tendon shortening refers to a condition in which the Achilles tendon loses its normal length and elasticity. This can lead to a range of symptoms, including pain, stiffness, limited range of motion, difficulty walking or running, Tightness, walk difficulties, and problems with balance (Chitra Badii, 2023).

Achilles tendon shortening can be congenital (present at birth) or acquired due to various factors, such as injury, muscle imbalances, or certain medical condition. Definin baseline compositional properties for normal tendon is necessary to set appropriate benchmarks for healing and to determine appropriate strategies for successful functional tissue engineering. Unfortunately, basic Achilles tendon compositional data is currently lacking, with the most thorough compositional studies performed using flexor tendons. As an extrapolation from data in other systems, Achilles tendons are thought to be composed of approximately 90% type I collagen that forms a hierarchical structure of fibrils, fibers, and fascicles bound together by small matrix molecules, such as proteoglycans (Longo UG, et al. 2009).

Most common causes Achilles tendon shortening are Imbalances between the calf muscles and the opposing muscles in the front of the lower leg can lead to Achilles tendon shortening. If the calf muscles (gastrocnemius and soleus) are stronger and tighter compared to the muscles in the front (tibialis anterior), it can result in a shortened Achilles tendon (Sätilä, H.et al . 2026). Prolonged periods of inactivity or immobilization, such as being in a cast or wearing a walking boot, Overuse or Repetitive Stress, Injury or Trauma, Cerebral palsy (Haynes KB, et al. 2018), Muscular dystrophy (Van Kuijk AAA, et al.2014), Stephanie Booth, 2023) Autism (Szopa A, et al.2016)

Achilles tendon diagnoses by clinical examination and radiography by MRI (Magnetic Resonance Imaging) is often used to diagnose issues with the Achilles tendon, such as tendonitis, partial tears, or complete ruptures. MRI provides detailed images of the soft tissues, allowing doctors to assess the extent of the injury and plan appropriate treatment (Sharma, B. B., et al. 2017)

Treatment by physical therapy play important role to return to daily activivty in short time especially after surgery Souliman[1], S. et al 2019). . Physiotherapy played an important role in recovering patients Souliman, S. I., et al. *2022)* Souliman, S. I.et al, 2024).

Treatment achilles tendon lengthening followed by a 4-week cast fixation and corrective orthotic therapy under talo-navicular reposition for at least 6-months (Blümel, S., et al. 2023).

Surgery further lengthens the tendon, restoring dorsiflexion but not normal muscle-tendon architecture. These architectural features likely affect function, possibly contributing to functional deficits such as plantarflexor weakness after surgery (Wren, T. A., et al. 2010). operative Achilles lengthening corrects fixed ankle equinus that exists with the knee flexed as well as extended. The ultimate goal is to improve ankle dorsiflexion, ideally to 10 degrees of ankle dorsiflexion past neutral with the knee flexed and 5 degrees with the knee fully extended (Tabaie, S. A., & Videckis, A. J. 2021).

TATS in combination with TAL shows a satisfactory long-term result after 5.8 years in the correction of fixed equinus and drop foot in children with CP. Postoperatively all subjects were able to walk without an AFO (Kläusler, M., et al. 2017).

The aim of study is causes, symptoms, and treatment methods for Achilles tendon shortening and its impact on children, specifically.

MATERIALS AND METHODS

Medicare Provider Analysis and Review files were used to identify all cases for Achilles tendon shortening in Orthpedic department Tobruk medical centre and al-malak clinic Physical therapy in Tobruk, Libya held through 2023, where 11 total of patient, Where the recorded cases rate during the year 2023 was 14 patients, but only 6 were followed up with physical therapy. as shown in Table 1.

Table:(1). The Patients Data.

Surgery or no	Sex	Age	Patient
Surgery, no PT before surgery	Male	5	P1
No surgery	Male	6	P2
Surgery	Male	10	P3
Surgery	Female	7	P4
Surgery	Female	5	P5
Surgery	Male	5	P6
Surgery	Female	6	P7
Surgery	Male	5	P8
Surgery	Male	6	P9
No surgery	male	5	P10
Surgery	Male	3	P11
No surgery	Male	1	P12
No surgery	Female	9	P13

P: patient number.

Physical therapy: Out of a total of 14 children, 4 were followed up with natural therapy, and 3 of them did not undergo any surgery. The remaining children underwent surgery at the ages of 1 and 5 years. The therapeutic program

was as follows: the therapeutic program for delay walking and sitting: Passive movement for ankle joint(dorsifexion. Planterfexion.inversion and evrsion) repeated 20 time respectively, From supine on incline wedge to sit, repeat 10 times for right and left side Fig 2. From supine on incline wedge to stand, kneeling position catches block to half knelling, from bear standing to stand, runner strech , standing on one limp with rotation with support by Physiotherast with patient cannot stand, squat to stand, from sitting on small block to forward standing alone, step up over small box (with support by P.sT, incline walking facilities from pelvic (support by P.sT, climbing stairs supported from ankle, treadmill 10 min (by support).

The therapeutic program for unbalance walking: from sitting on lap to stand and rotate to across therapist lap on both sides. Symmetrical stand on balance board alone with later weight shifting by hand activity, from sitting on small block to forward standing alone fig 1, standing on one limp with rotation, squat to stand fig 3, step standing on block with AB weight shifting., step up over small box, standing symmetrical with weights, step standing with weights, walking over balance catching cord, kicking roll, semi squat to standing fig 4, walking over balance catching cord, zigzag walking facilities from pelvic, incline walking facilities from pelvic , climbing stairs supported from ankle, side walking over beam, walking over obstacles forward catching sticks , side walking over obstacles catching sticks, walking facilities from pelvic kicking roll, treadmill 10min fig 5, parallel bar with bock, Hot therapy (Infra-red).fig 6, Electrotherapy.

Fig (1). Squat to Stand.

Fig: (2). on Incline Wedge to Sit.

Fig: (3) from Sitting On Small Block To Forward Standing Alone

Fig: (4) The Treadmill.

Fig: (5) Parallel Bar with Block.

Fig (6) Infra-red.

Statistics

Statistics and graphing were done using EXCEL Microsoft Office professionals plus 2016 version.

RESULT AND DISCUSSION

Medicare Provider Analysis and Review files were used to identify all cases for Achilles tendon shortening in Orthopedics department Tobruk medical center and al-Malak clinic Physical therapy in Tobruk, Libya held through 2023, where 11 total of patient, Where the recorded cases rate during the year 2023 was 14 patients, but only 6 were followed up with physical therapy.

According to the data in this study, the rate of males was greater than the number of females, as in fig (7).

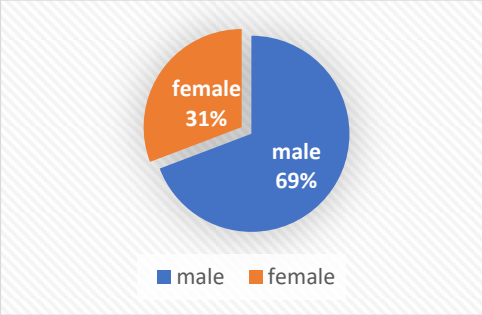

Fig: (7) Ratio males to females.

The percentage of male children was 69% and female children were 31%.

The most common pathological causes were the result of cerebral palsy or brain atrophy, but we cannot determine a specific percentage because some children had an unclear diagnosis and the causes are unknown.

Most of the children who were registered as cases of tendon shortening were followed up with physical therapy, while others were not able to be followed up, and some of them moved for treatment outside the city as shown fig 8.

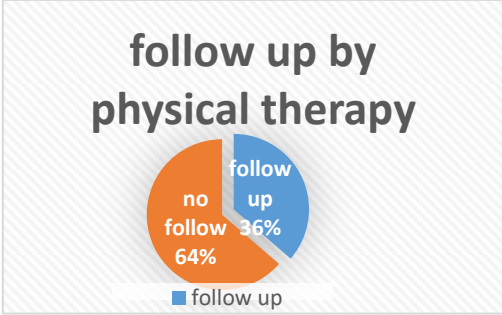

Fig: (8) Follow up Ratio.

The ages of the children varied between 1 and 10 years. Some of them had a tendon operation, and some had surgery after physical therapy.

Two of the children who was followed up with physical therapy after undergone the operation one of them at 2 old years, he delay walk, but after physical therapy within two weeks he was able to stand on his own and walk, the shortening of the tendon was as result brain atrophy. And still have balance problem. And another child on 6 old years, However, when physical therapy is stopped, the muscle and tendon tension return and the same problem occurs, and it is recommended to continue physical therapy.

Two children suffer from tendon shortening, one of them is a six-year-old girl for unknown reasons, and a one-year-old child due to cerebral palsy. After physical therapy, he

noticed a significant improvement in the muscles and tendons.

Physical therapy is very successful with children in which it treats the causes of the problem, but for children who suffer from brain atrophy or cerebral palsy, even after surgery on the tendon, the problem continues, and physical therapy must be continuous with them.

Chitra Badii, (2023) common symptoms limited Range of Motion: One of the primary symptoms of Achilles tendon shortening is a reduced ability to fully flex or extend the foot. May find it difficult to point your toes downward (plantar flexion) or pull your foot upward (dorsiflexion) (Chitra Badii, 2023). That agreement with this study.

Van Kuijk AAA, et al. (2014) Muscular dystrophy. Toe walking is sometimes caused by a genetic disease that causes muscle fibers to become unusually damaged and weak over time.

This diagnosis is likely to fit your child's condition, especially if your child walked normally before starting toe walking (Van Kuijk AAA, et al.2014). İn our study most common causes cerebral palsy and brain atrophy.

Szopa A, et al.(2016) Autism. Toe walking is linked to autism, a disorder of the mental attention chain, and affects a child's ability to communicate and interact with others. (Szopa A, et al.2016). İn our study most common causes cerebral palsy and brain atrophy

Sätilä H, et al. (2016) Most common causes Muscular Imbalances between the calf muscles and the opposing muscles in the front of the lower leg can lead to Achilles tendon shortening. If the calf muscles (gastrocnemius and soleus) are stronger and tighter compared to the muscles in the front (tibialis anterior), it can result in a shortened Achilles tendon (Sätilä H, et al. 2016). İn our study most common causes cerebral palsy and brain atrophy

Souliman, S. I., et al. 2022 (Physiotherapy played an important role for patients to recover and return to normal life in the least time (Souliman, S. I., et al. 2022). That agreement with this study.

Souliman, S. I., et al (2024) Physical therapy plays important role to rehabilitate the patient physically and psychologically, in addition to help the patient to return and recovery in less time (Souliman, S. I., et al. 2024). This agreement with our study.

Sätilä, H.et al .(2026). The Achilles tendon may feel tight and stiff, particularly when you try to move foot or ankle. This tightness can be more pronounced in the morning or after periods of rest,

Achilles tendon shortening can cause pain and discomfort in the back of the ankle, near the heel. The pain may worsen with activity or prolonged periods of standing or walking, the reduced flexibility in the Achilles tendon can affect your gait and walking pattern (Sätilä, H.et al . 2026). this agreement with study.

CONCLUSION

We conclude from our study on Achilles tendon shortening at Tobruk Medical Centre and other private clinic, The shortening of the tendon may be due to no other known cause, but it is treated with physical therapy. However, if it is the result of other diseases such as cerebral palsy or brain atrophy, the treatment may be slow, even after a tendon lengthening surgery is performed.

Physiotherapy at played an important role in recovering patients in a short time and returning to daily activities.

Through this study, we recommend that families of children with shortening of the torsion due to other diseases such as cerebral palsy, whether they have had an operation or not and have not improved, continue physical therapy.

We also emphasize the need for early examine children with shortening tendon may lead to better results. And further studies are required to confirm these findings.

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ETHICS

We have ethical approval from the research studies office of Tobruk University.

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معدل الإصابة بين الذكور أعلى من الإناث؛ حيث كانت نسبة الأطفال الذكور 69% بينما كانت نسبة الإناث 31%. يلعب العلاج الطبيعي دورًا مهمًا في العلاج. وهناك حاجة إلى مزيد من الدراسات لتأكيد هذه النتائج.

الكلمات المفتاحية: وتر العرقوب، قصر الوتر، مركز طبرق الطبي، العلاج الطبيعي، إعادة التأهيل، الأشعة.

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الملخص

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تهدف هذه الدراسة إلى التحقيق في أسباب وأعراض وطرق علاج قصر وتر العرقوب وتأثيره بشكل خاص على الأطفال، بالإضافة إلى تشخيصه باستخدام الأشعة. يُعد وتر العرقوب، المعروف أيضًا بوتر الكعب، أكبر وأقوى وتر في جسم الإنسان. يقع في الجزء الخلفي من أسفل الساق ويربط عضلات الربلة (عضلتا الساق التوأمية والنعلية) بعظم الكعب (العقب). يلعب وتر العرقوب دورًا حيويًا في تمكين القدم من الثني والمد، مما يسمح بممارسة أنشطة مثل المشي والجري والقفز. تم جمع بيانات هذه الدراسة من قسم جراحة العظام بمركز طبرق الطبي وعيادة الملاك للعلاج الطبيعي في طبرق، ليبيا. تم تسجيل 14 حالة خلال عام 2023، ولكن تم متابعة 6 حالات فقط بالعلاج الطبيعي. تم تشخيص الحالات من خلال الفحص السريري والأشعة. أحد النتائج أشارت إلى أن قصر الوتر قد يكون ناتجًا عن أسباب غير معروفة أو نتيجة للإصابة بالشلل الدماغي أو ضمور الدماغ. وُجد أن