

Ultrasonographic Differential Diagnosis of Tenosynovitis in Horses. A report of 40 Cases

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Abstract: The present study was carried out on 40 horses (34 draft and 6 race). The study was aimed to demonstrate the role of ultrasonography for differential diagnosis of tenosynovitis in horses. In acute aseptic tenosynovitis, the increased synovial fluid appeared as clear anechoic fluid between the flexor tendons and within the digital sheaths with variable degree of synovial membrane thickening. In cases with acute hemorrhagic tenosynovitis, hyperechoic dots representing the cellular nature of the fluid floating in an increased anechoic synovial fluid were noticed. In cases with acute septic tenosynovitis, the synovial fluid appeared more echogenic than the normal (hypoechoic) with marked thickening and increased echogenicity of the synovial membrane. Cases with chronic tenosynovitis showed thickening of the digital sheath with marked hypoechoic bands within the anechoic synovial fluid.

[Torad, F.A.; Inas, N. El-Husseiny; Ibrahim, M.I. and Ali, K.M. **Ultrasonographic Differential Diagnosis of Tenosynovitis in Horses. A report of 40 Cases.** *J Am Sci* 2012;8(9):927-931]. (ISSN: 1545-1003).

<http://www.jofamericanscience.org>. 128

Keywords: Ultrasonography, Tenosynovitis, Horses

1. Introduction

Ultrasound has been used for equine musculoskeletal imaging since 1980. Firstly used in race horses and since that time, ultrasound gained a worldwide acceptance as a diagnostic tool for any region of the horse (**Redding, 1991 and Dyson, 2004**).

Tenosynovitis of the digital sheath is a common disorder in equine and often associated with adjacent tendinitis (**Redding, 1991**). It is classified into idiopathic, acute, septic and chronic tenosynovitis (**Honnas et al., 1991 and Cynthia and Kahn, 2011**). Acute tenosynovitis characterized by rapidly developing effusion within the tendon sheath accompanied by heat, pain and possibly lameness (**Stashak, 2002**).

Septic tenosynovitis characterized by marked suppurative synovial fluid effusion, heat, pain and severe lameness (**Honnas et al., 1991**).

Many diagnostic tools have been encountered in the diagnosis of tenosynovitis such as ultrasonography, synovial fluid analysis and tenosynovioscopy (**Smith and Wright, 2006**). Ultrasonographic examination of tenosynovitis demonstrates excessive anechoic synovial fluid within the sheath with variable degree of synovial membrane hypertrophy and thickening (**Dyson and Dick, 1995**). In septic tenosynovitis the synovial fluid often appears more echogenic than normal while in chronic tenosynovitis, thickening of the synovial membrane and adhesions are the most prominent sonographic features (**Maoudifard, 2008**).

The purpose of the present study is to demonstrate the role of ultrasonography as a diagnostic tool for the differential diagnosis of tenosynovitis in horses.

2. Material and Methods

This study was carried out on 40 horses (34 draft and 6 race horses). The animals were presented as clinical cases admitted to the Surgery clinic, Faculty of Veterinary Medicine, Cairo University and Brook's hospital in Cairo.

Cases of tenosynovitis were diagnosed based on collection of the following data: Case history including age, sex, and nature of work, duration and onset of the condition. All the suspected cases were subjected to complete clinical examination for detection of the lame limb, degree of lameness, heat, pain swelling or any other abnormalities. Palpation was done on both weight and non weight bearing positions according to (**Linda and Schultz, 2004**) to detect any abnormal lesions at the affected synovial sheath as well as their associated tendons.

Ultrasonographic differential diagnosis of tenosynovitis was performed by using multifrequency probes (8-10 MHz linear probe and 5-7 MHz microconvex probe)* and included detection of any abnormalities in size, echogenicity, adhesion and nature of synovial fluid.

The affected area was prepared for ultrasonographic examination through clipping, shaving of hair and application of acoustic coupling gel then tow perpendicular scans (longitudinal and transverse) were imaged and printed.

In some cases, the ultrasonographic differential diagnosis of tenosynovitis was confirmed by guided needle aspiration and the nature of aspirated fluid was compared with the ultrasonographic pictures and explained such pictures.

3. Results

The present study demonstrated presence of different types of tenosynovitis in 40 cases (18 cases in

the right hind limbs, 14 cases in the left hind limbs and 8 cases in the left for limbs).

Table (1): showing the incidence and clinical findings of different types of tenosynovitis.

Affection	Number	Age	Sex	Clinical findings
Acute aseptic tenosynovitis	26	3–9 years	16 males and 10 females	fluctuating swelling of the sheath without apparent lameness
Acute hemorrhagic tenosynovitis	6	2-6 years	3 males and 3 females	painful, swollen digital sheath with mild degree of lameness
Acute septic tenosynovitis	2	2 months and 2 years	1 male and 1 female	Painful swollen digital sheath with severe degree of lameness
Chronic tenosynovitis	6	4-9 years	4 males and 2 females	Hard painful swelling with mild degree of lameness.

Clinically, the affected limb showed swelling of the digital sheath which was seen at the lateral and medial aspects of the metacarpus/metatarsus (Fig.1).

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In one case with severe traumatic tenosynovitis the swelling included the lateral, medial and planter aspects of the distal metatarsus (Fig.2).

The ultrasonographic examination revealed that, in acute aseptic tenosynovitis, the increased synovial fluid appeared as clear anechoic fluid between the flexor tendons and within the digital sheathes with variable degree of synovial membrane thickening (Fig.3a&b).

In cases with acute hemorrhagic tenosynovitis, the synovial fluid showed an increased amount which appeared as anechoic fluid surrounding the flexor tendons with hyperechoic dots representing the cellular nature of the fluid (Fig.4 a&b).

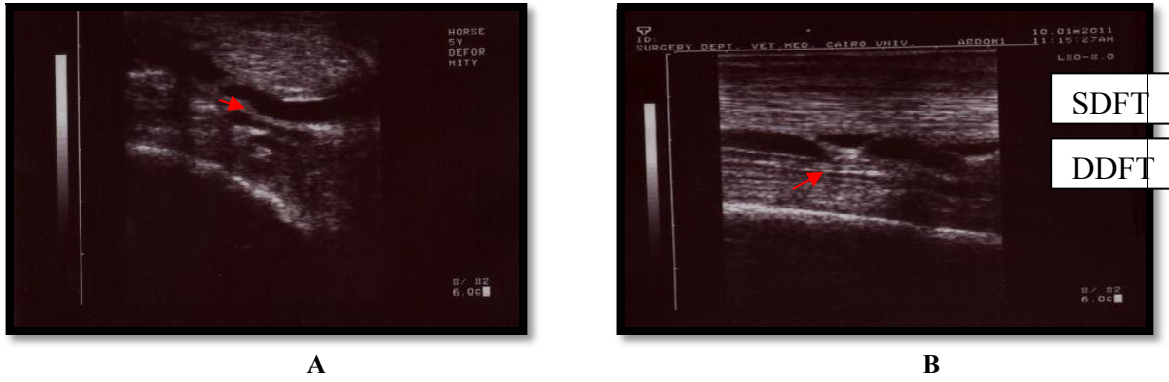
In cases with acute septic tenosynovitis, the synovial fluid appeared more echogenic than normal (hypoechoic) with marked thickening and increased echogenicity of the synovial membrane. Adhesions between superficial and deep digital flexor tendons were seen as hypoechoic strands within the anechoic fluid (Fig. 5 a&b).

Cases with chronic tenosynovitis showed thickening of the digital sheath with marked hypoechoic bands within the anechoic synovial fluid. In some cases, a hypoechoic structure between the flexor tendons representing the organized fibrin was noticed (Fig.6 a&b.).

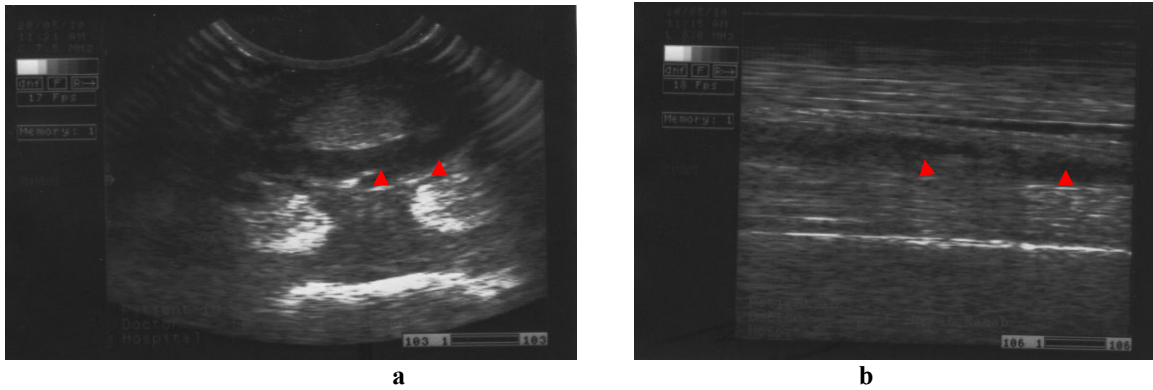
Ultrasonographic guided needle aspiration of the synovial fluid revealed either, clear synovial fluid in cases with traumatic aseptic tenosynovitis or bloody 928synovial in hemorrhagic tenosynovitis or infected fluid (pus) in cases with septic tenosynovitis.



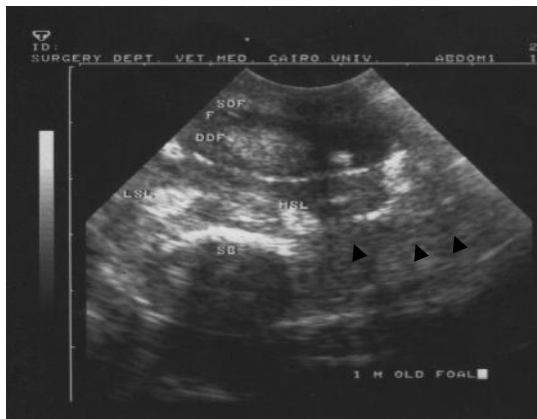
Fig, 1& 2: (1) Traumatic tenosynovitis, showing swelling of the digital sheath at the lateral aspect of the distal metatarsus. (2) Case of severe of traumatic tenosynovitis, the swelling included both the lateral, medial and plantar aspect of the distal metatarsus.



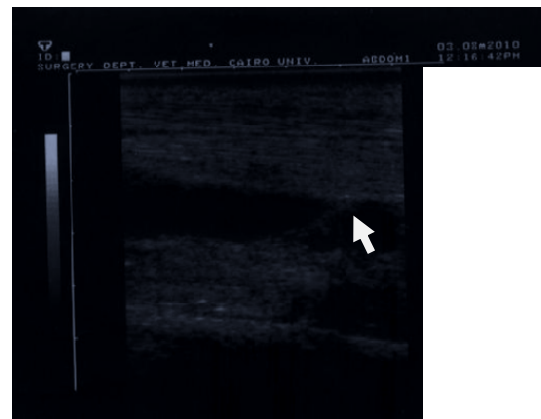
Fig, 3 a&b: (a) Transverse sonogram of the SDFT and DDFT in the metatarsal region obtained 6 cm proximal to the metacarpophalangeal joint revealed mild degree of tenosynovitis with synovial membrane hypertrophy (arrow). (b) Longitudinal sonogram of the same case showing hypertrophy of the synovial membrane in the form of hypoechoic bands connecting the flexor tendons forming pockets filled with anechoic synovial fluid (arrow).



Fig, 4: (a) Transverse sonogram showing hemorrhagic tenosynovitis with thickening and enlargement of the digital sheath with slight increase in the echogenicity of the synovial fluid due to its cellular nature (arrow heads). (b) Longitudinal scan showing hemorrhagic tenosynovitis with areas of mixed echogenicity in between the flexor tendons (arrow heads).



Fig, 5a: Transverse sonogram of a foal showing septic tenosynovitis with hypoechoic fluid around the flexor tendons and clear curvilinear hyper-echoic digital sheath (arrow heads)



Fig, 5b: Transverse sonogram of a horse with septic tenosynovitis: anechoic fluid surrounding the flexor tendons accompanied by marked decrease in the echogenicity of the flexor tendons. Adhesion was noticed as hypoechoic band within the anechoic fluid (arrow).



Fig, 6a: Longitudinal sonogram of the flexor tendons from a horse with chronic tenosynovitis, showing thickening and hypertrophy of the digital sheath with presence of small amount of anechoic fluid (arrows) surrounded by the thickened hypoechoic digital sheath (pockets like).



Fig, 6b: Transverse sonogram of the flexor tendons from a horse with chronic tenosynovitis showing thickening and enlargement of the digital sheath with hypoechoic structure representing the organized fibrin (arrow).

4. Discussion

Diagnostic ultrasonography has been recently applied for the assessment of some musculoskeletal problems such as evaluation of bones, joints, tendons ligaments, muscles and nerves (**Gibson and Steel ,2002**).

Acute traumatic tenosynovitis of the digital sheath was encountered in draft horses more than the race horses, and this may be due to our local conditions as the draft horses are usually subjected to overwork, poor nutrition, lack of exercises, uneven roads and high loads carried by those animals.

Regarding the clinical findings of acute traumatic tenosynovitis. The affected limb showed swelling of the digital sheath. The swelling was painful and hot in cases with hemorrhagic and septic tenosynovitis. The same was mentioned by **EL-Husseiny (2000) and Stashak (2002)**.

Ultrasonographic examination of cases with traumatic tenosynovitis revealed presence of anechoic fluid (synovial fluid) between the flexor tendons and within the digital sheath which may be due to digital sheath effusion that was evidenced by variable degree of synovial membrane hypertrophy and thickening. The same was mentioned by **Maoudifard (2008)**.

Ultrasonography was proved to be valuable method for differentiation of different types of tenosynovitis as cases with hemorrhagic tenosynovitis showed anechoic fluid (synovial fluid) surrounding the flexor tendons with hyperechoic dots representing the cellular elements (chromatin from damaged red blood cells) of the fluid. Similar findings were mentioned by **Nyland and Mattoon (1995)**.

In septic tenosynovitis, the synovial fluid appeared more echogenic than normal with marked thickening and increased echogenicity of the synovial membrane, in addition to hypoechoic bands appeared in some cases representing organization and fibrosis.

The results were coincided with **Reef (1991), Graychee (1995) and Reef (1998)**.

In chronic tenosynovitis, the irregularity of the deep digital flexor tendons may be attributed to thickened and hypertrophied synovial membrane while chronicity of some cases leads to formation of hypoechoic structure between the flexor tendons indicating organization and fibrosis. The same findings were mentioned by **Nyland and Mattoon (1995)**.

Ultrasonographic guided aspiration proved the role of ultrasonography for the differential diagnosis of tenosynovitis as the nature of the aspirated fluid certified the ultrasonographic picture and thus, we can say that ultrasound presents a safe diagnostic tool as no risk of infection or special precautions in comparison with aspiration.

In conclusion, ultrasonography proved to be a valuable, safe, noninvasive and rapid diagnostic tool for the differential diagnosis of different types of tenosynovitis in horses.

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8/25/2012