

CLINICAL AND ULTRASOUND REPORT

Paco Boy Filly

15th April 2014 to 28th July 2014

Paco Boy Filly

Clinical and Ultrasound Report Background

This Filly sired by Paco Boy is an unraced two year old thoroughbred. It was reported that he has sustained a significant left fore limb tendon injury. I understand this horse has no previous history of tendon problems. Any spontaneous, non-trauma injury to a tendon in a horse of this age is unusual.

I understand that this injury occurred on 9th April 2014. It was obvious that a serious injury had been sustained due to the external appearance of the superficial digital flexor tendon (SDFT). The management to date has been a combination of supportive bandaging, box rest and the Zamar machine*. This was followed by a short period of bandaging with short duration walking in hand.

Clinical Examination 14th April 2014

I attended Derek Shaw racing to assess the condition of the tendon and undertake an ultrasound examination.

- Diffuse and significant soft-tissue swelling in the area of the digital flexor tendons and suspensory ligament on the left distal fore-limb. This is shown in Figure One
- A loss of delineation of any of the soft-tissue structures on the posterior lower fore limb below the carpus region
- An engorged, puffy, hot and highly misshaped left superficial digital flexor tendon (SDFT).
- A long pastern bone (distal phalanx) which creates a long range of travel for the flexor tendons when the fetlock joint is extended shown by the arrow in Figure One.



Figure 1

Diffuse, soft-tissue swelling of the distal left fore limb

A long pastern bone (distal phalanx) which creates a long range of travel for the flexor tendons when the fetlock joint is extended shown by the arrow in Figure One.

The distal left-fore limb has developed a dropped position at the fetlock joint. This is shown by the arrow in Figure One. I imagine that this is due to the fact that the SDFT is taking no strain. Surprisingly this horse is not too lame and appears to walk out for short distances quite comfortably. However, when standing it is clear that she is not comfortable and weight bears on the contralateral side.

Ultrasound Report

An ultrasound examination was conducted on digital flexor tendons, suspensory ligament and other surrounding soft-tissue structures on both fore limbs. The images contained within the report illustrate the extent of the injury.

Examination Date: 14th April 2014

Left Fore Limb

The left fore superficial digital flexor tendon (SDFT) has 'blown' completely. There is a massive degree of damage to the tendon's extra cellular matrix (ECM; the structure that makes up the tendon) from the proximal third (top) downwards. The tendon's structural architecture has lost any semblance of order and the tissue matrix has collapsed and been replaced with tissue debris, tissue fluid and blood.

There is a significant amount of fluid within the SDFT itself and in the surrounding area demonstrated by the multiple hypoechogenic (black) regions on the scan image. The internal part of the tendon is of a similar consistency the blood vessel. These appearances are well demonstrated in the longitudinal and cross-sectional images in Figures Two to Five.

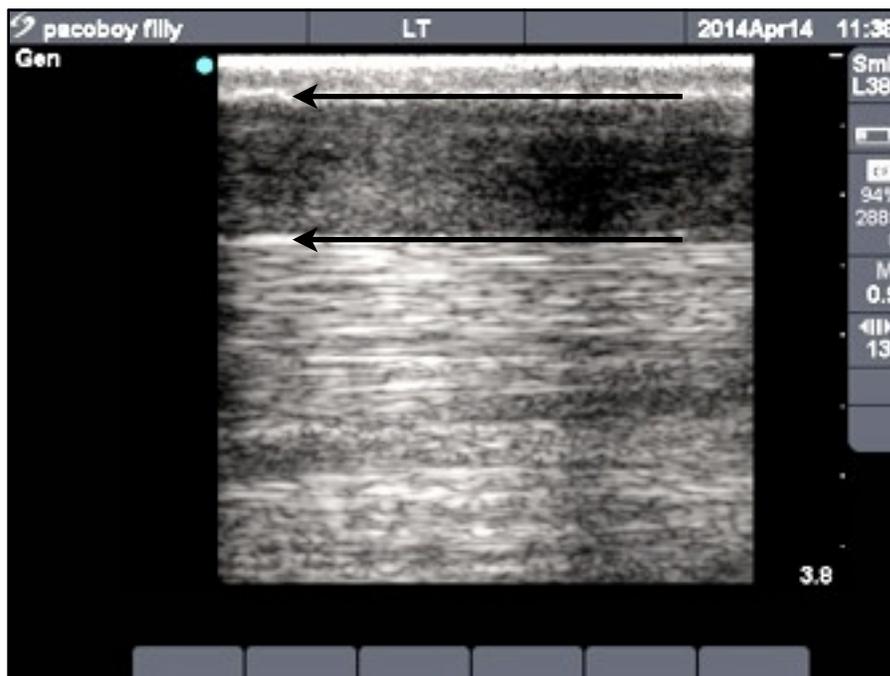


Figure 2
The left fore SDFT is highlighted between the arrows. There is no recognizable tissue matrix. The SDFT is massively enlarged and completely obscures the other soft-tissue structures

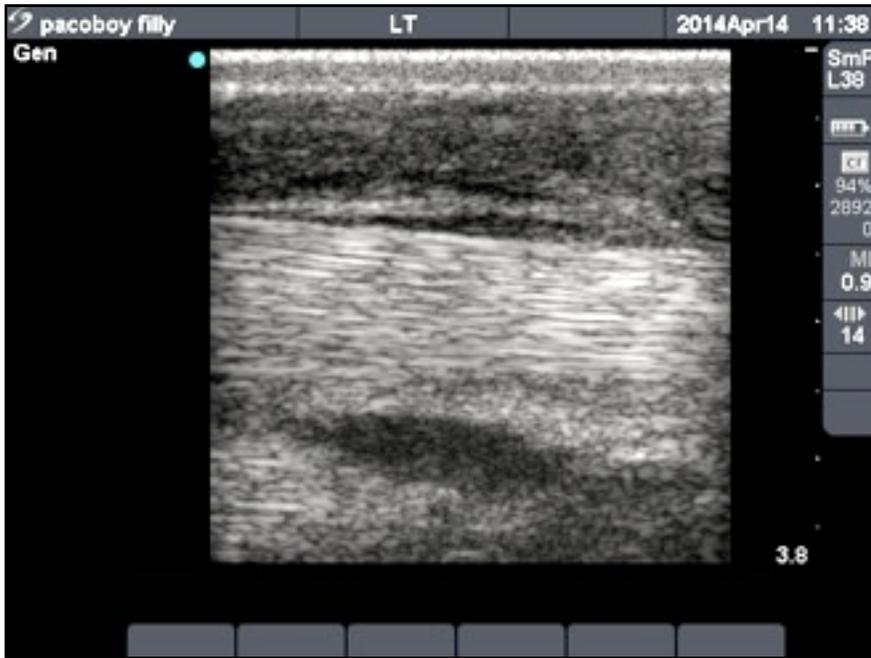


Figure 3
The left fore SDFT has multiple hypoechoic (black) areas suggestive of fluid and tissue debris that has replaced the normal tendon tissue architecture.

Cross-Section

The cross-sectional examination which better shows the position and extent of the injury reveals that the SDFT has a diffuse, irregular shaped border with a large section on the medial (inside) side absent. This is shown in Figure Four.

Given the extent of the soft-tissue swelling it is difficult to accurately comment upon the other structures in the area partly because they have been displaced by the fluid, blood and tissue debris that has infiltrated the area.



Figure 4
The cross-section image shows the SDFT with no discernible border and a massive degree of internal damage.

This area shows a large 'chunk' of tendon tissue absent from the SDFT. There is a large amount of fluid, probably blood in this area.



Figure 5
This cross-section image shows the SDFT with high degree of internal damage but with a discernible border.

Summary

This is a catastrophic injury to the left fore SDFT. The pre-injured highly ordered structure of the tendon, its extra cellular matrix, has been completely destroyed. I strongly suspect that this injury has been caused by a 'tear' type mechanism where the structure has failed to cope with the load bearing pressure placed through it.

Whilst this is a significant tendon injury I do not believe that the left SDFT has completely ruptured. On the ultrasound examination I can follow some remnants of tendon tissue from its origin at the muscle/tendon interface to the insertion below the fetlock joint. The fact that it is not full ruptured does affect and in my opinion significantly improve the prognosis.

The worry at this presentation stage is the dropped stance of the left distal fore limb at the fetlock joint. This has been caused by the fact the SDFT has no supporting capacity. In addition, the huge amount of swelling in the SDFT has impinged upon the normal functional dynamics of the deep digital flexor tendon and suspensory ligament.

Right Fore Limb

Longitudinal Examination

The delineation of the fibrillar pattern in the right fore SDFT is slightly more defined than is commonly seen in a tendon unaffected by pathology. This appearance is present when the tendon tissue has been placed under increased strain resulting in a reaction in and a modification of the tissue type with the tendon; commonly fluid infiltrates the tendon fascicles (bundles of the smaller fibrils). I suspect that this tendon is showing signs of increased weight bearing strain given the condition of the contra-lateral side.

Cross-Section

There are no specific areas of tissue indicating any defined lesion within the tendon.

Overall Prognosis

Under normal circumstances given the extent of the injury the overall prognosis of the condition would be bleak. The early management of such injuries is critical in affecting the eventual outcome. The fact we are in a position to manage this case early is a huge advantage.

On the positive side the horse is young appears to be easy to manage and the injury has not passed the point of being unsalvageable. In my opinion another couple of weeks and the tendon would have past that point.

Treatment Plan

When a tendon has this degree of damage there are a number of issues to consider:

1. To successfully move the injury out of the acute phase without any longterm changes to the soft-tissue structures involved
2. Whether there is sufficient new tissue (collagen) produced from the tendon cells to form a new tissue matrix
3. That the new tissue produced can configure correctly into a new extra cellular matrix, the tendon's structure, that functions with the remains of the existing one
4. Ensuring that further damage is not done to the maturing and remodeling collagen structure during the rehabilitation phase.
5. That the horse remains skeletal balanced during the rehabilitation period so secondary injuries are not acquired during the treatment process.

The Tendonology Treatment Regime

The latest research from The Kadler laboratory (The University of Manchester) which is undertaking a programme of specific tendon research using our unique Synapse technology, has shown that the tendon is surrounded by a skin-like epithelium that protects and nourishes the tendon. The epithelium is a mixture of epithelial and stem cells. A genome-wide analysis shows that the epithelium expresses genes in common with skin epithelial cells. These genes include enzymes, keratins, chemokines, and genes of the late cornified envelope complex.

The aim of the treatment used for this horse is to stimulate the epithelial cells in the skin immediately adjacent to the tendon to synthesize growth factors originating from skin epithelial cells to improve re-epithelialisation of injured tendon. The secretion of diffusible growth factors that aid tendon healing are triggered by the application of a small micro-electric current delivered to the surrounding skin via skin surface electrodes.

The treatment is painless (sub-sensory) and applied several times a day over a three to four week period. During this time regular diagnostic ultrasound assessments are conducted that monitor the progress of the tendon healing. The treatment will start when the inflammation of the surrounding soft-tissue has reduced.

In addition, a programme of controlled, incremental exercise is undertaken with the aim of maintaining a balanced condition to the horse and to promote a successful remodeling phase of immature collagen tissue into the organised extra cellular matrix that forms the tendon.

Immediate Treatment Plan

The injury to the left SDFT has caused collateral damage to the surrounding soft-tissue structures. These areas will have torn tissue with the associated blood and tissue fluid leakage and inflammation. For this a Zamar unit will be used which is a revolution in cold and heat therapy. This is a new method of administering cryotherapy (cold) and thermotherapy (heat) to athletes and horses. The Zamar unit provides continuous and programmable cold or heat therapy combined with a massage function. For this case cold therapy will be used with the aim of reducing inflammation and closing down damaged peripheral blood vessels which I suspect are being torn and hence leaking when the horse moves. In addition, the therapy will be used following walking exercise which will be used with the aim of promoting a return to the normal posture of the distal fore limb.



Figure 7

The Zamar massage cryotherapy boot in place with the aim of reducing soft-tissue damage and allowing walking exercise to return the fetlock joint to a normal stance.

The area is treated for ten minutes then the horse walked with no boot or support followed by a further ten minutes of therapy.

Shoeing

Both fore feet will be fitted with graduated reduced concussion pads in the interest of symmetry and balance for the rest of the horse. The graduation of these pads was to be decreased over the treatment time as the tendon heals. A wide web, aluminum, quarter clipped shoe will be applied with a slight lateral extension to the left fore. Hind shoes of adequate width and length will be applied in the interest of reducing uneven load bearing on both fore limbs during the recovery period.

Conclusion

This Filly has presented with a very significant injury to the left fore SDFT. This horse now requires a patient approach to the treatment process with regular monitoring but I am very confident that a positive outcome will be achieved. The following month will be critical.

David Chapman-Jones. April 2014

Update to 28th July 2014

Tendon Treatment

I summarised that the left fore limb SDFT had a high degree of breakdown to the architectural structure that makes up the tendon. The right fore SDFT also presented with some structural changes.

Despite the catastrophic damage to the tendon the treatment regime progressed steadily but very well. Tendons are 'at rest' during the night, outside daylight hours, even though horses are weight bearing animals that remains the case and they are best treated at night (it's complicated science involving sleep hormones!). Therefore, in an attempt to maximise the treatment efficacy the tendon was treated during the evening which has appeared to be successful. Along with the treatment we used the Zamar machine frequently to reduce the effects of the inflammatory process that was a constant issue in the surrounding soft-tissue as new tissue was damaged as the fetlock joint went through its normal range of movement. In the early stages of the treatment process managing the swelling was a significant issue.

However, despite the daily issues we had treating the tendon good progress was made and sixteen weeks following the horse's arrival the change is very encouraging. The horse is now moving freely and will be introduced to free paddock exercise when turned out. She is being ridden three days a week and is comfortable on the affected left fore limb.

There's a way to go yet to reach a point where she will be able to comfortably undertake more intense work but I am confident that day will not be too far off.

Follow-up ultrasound Report 12/04/2014

The progress of the treatment is illustrated by the following ultrasound images from the original examination on 14th April 2014 and the last examination on 27th July 2104.

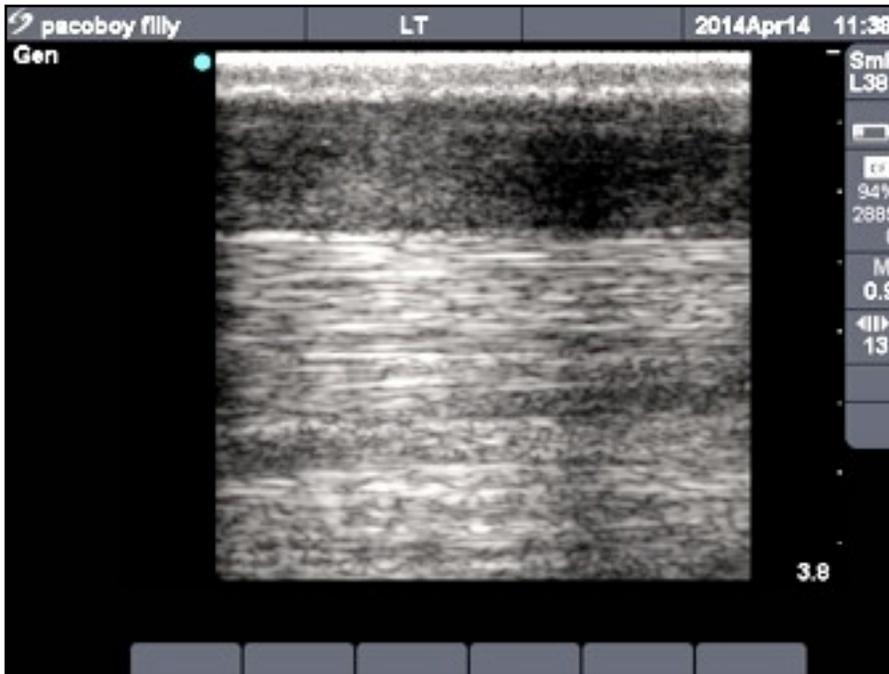


Figure 8: 14/04/14:
The longitudinal examination shows a highly disorganized fibre alignment in the ECM inter-spaced with hypoechoogenic tissue and swollen tendon.

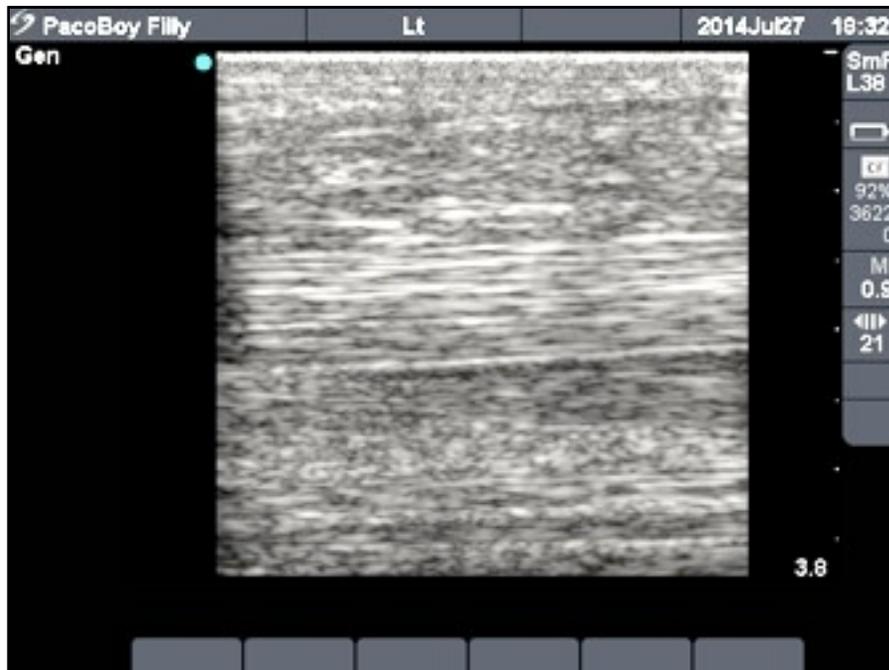


Figure 9: 27/07/14:
The longitudinal examination shows a more well organised fibre alignment of the ECM. The tendon is no longer swollen.

The longitudinal examination in April 2014 showed a highly disorganized fibre alignment in the ECM of the tendon inter-spaced with the majority of the area filled with hypoechoogenic tissue.

The improvement can be seen in the comparable images from the original examination and the one sixteen weeks later. The fibre alignment is significantly improved and the large areas of hypoechogenic tissue has almost completely resolved.

Cross-section

Originally there was a large area of tissue disruption/hypoechogenic tissue throughout the whole cross sectional area of the tendon shown in Figure Ten. The cross-section image shows the SDFT with no discernible border and a massive degree of internal damage. This area shows a large 'chunk' of tendon tissue absent from the SDFT. There is a large amount of fluid, probably blood in this area. The images from the later examination in July highlight that the area of hypoechogenic tissue has resolved with a significantly improved pattern of echogenicity.



Figure 10: 14/04/14

The cross-section image shows the SDFT with no discernible border and a massive degree of internal damage. This area shows a large 'chunk' of tendon tissue absent from the SDFT. There is a large amount of fluid, probably blood in this area.



Figure 11: 27/07/14

The previously noted lesion has resolved very well and the tendon's ECM has changed & improved significantly.

Right Fore

In April 2014 I commented that the right fore SDFT had structural changes to the ECM. The last ultrasound examination on 27th July revealed that there has been an improvement in the appearance of the tendon particularly to the fibre alignment. I have no concerns over this tendon now.

Shoeing

When this horse arrived the secondary concern to the condition of the left fore SDFT was the stance in the left fetlock joint and the horses' long pastern bone placing a constant strain on the flexor tendon. This was addressed with remedial shoeing. Shoeing appropriately was a challenge, with a balance of making the horse comfortable to weight bear whilst not exacerbating the fetlock problem. A shoe was used that fully supported the heel aiming to improve the hoof pastern angle. During the treatment programme this horse was shod several times to gradually improve this. In addition, anti concussion pads were used in conjunction with the shoe to reduce the effects of concussion on the repairing tendon tissue.

Exercise Programme

The nature of the exercise plan was dictated by the severe condition of the tendon of this horse. Given the progress of the healing of the pathology in the left SDFT over the past sixteen weeks and the fact that the horse remains reasonably well conditioned I believe that the original objective is being achieved. To provide an over view of the exercise undertaken over the past weeks she has been walking in hand, incrementally increased week by week now up to for 10-15 miles a week in addition to long reining, treadmill sessions and ridden to easy trot.

A Typical day for her now is

- Treadmill for 10 minutes.
- School and/or ridden session. The purpose of this session is to improve general conditioning and proprioception. The school session is centered upon long reining 'steering' in and out of cones and over ground level poles to assist in promoting whole body balance. In addition she is ridden in the school.
- Walk in hand for 30 minutes.
- Turned out

Conclusion

This horse suffered from a significant tendon injury in the left fore limb; it has recovered remarkably quickly. The increase in exercise has progressed steadily over the past sixteen weeks and will continue incrementally over the coming weeks which will further improve the quality of the new maturing tissue of the tendon's ECM and her general conditioning.

David Chapman-Jones: July 2014