Laterally Offset Hoof Capsules and their Effect upon the Medial Hoof in Front Feet

Five Case Studies

Mark Trussler

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Abstract

The medial hoof distorts in response to the forces that constantly load onto it from the body above and from the ground below, but in a laterally offset hoof capsule, distortion can be exaggerated. The study explores the use of individual shoeing plans for five horses with laterally offset hoof capsules over a twelve month period. It was hoped stabilisation of landing and loading during movement would redistribute force more evenly throughout the whole hoof capsule reducing medial hoof distortion and allowing the medial hoof to develop and strengthen. All horses improved in some aspect with varying degrees of success. It became apparent from the results of this study that various methods were required and the shoeing plans needed to be re-evaluated and changed regularly over the twelve months.

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Shiela Rose B.A. (Hons) MSc

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Contents

Introduction

"No foot, no horse," and "A horse is only as sound as his feet".

These are two often quoted sayings of unknown origin that are as relevant today as in years past. It is believed that problems of the feet associated with lameness can be attributed to a variety of causes including conformation, foot imbalance, and how regularly the horse is shod.

It is generally accepted that it can take up to twelve months for the hoof to grow from coronary band to distal border at the toe. In a twelve month cycle the foot has a minimum and maximum period of growth related to the time of the year. It is thought that the greater the amount of growth over a shoeing cycle could have an effect on the foot balance. Seasonal changes in temperature and humidity can also have an affect on hoof growth (Williams, G. Deacon, M. 1999)

The hoof distorts in response to the forces that constantly load onto it from the body above and from the ground below. Medio-lateral (M/L) imbalances are not uncommon and are a symptom of uneven hoof loading. Horses with laterally offset hoof capsules typically have further conformational faults including lateral rotation, laterally offset carpus, and have valgal deformities from the carpus and the metacarpo-phalangeal joint. Where these faults are combined with a laterally offset hoof capsule a greater degree of foot imbalance will typically be found. It is thought that predisposing conformational faults lead to hoof distortion, hoof displacement and limb instability when the horse lands and loads through the affected limb, thus further exaggerating the imbalances in the foot. (Balch, O.K. Butler, D. Collier, M. A. 1997).

Hoof balance is usually assessed in three planes; M/L, hoof pastern axis (HPA); and solar symmetry (Curtis, S. 1999). For the purpose of this study M/L balance and solar symmetry will be the main criteria of assessment, although dorso-palmer balance will be considered a contributing factor affecting M/L balance and solar symmetry. Various methods of assessing M/L foot balance have been described including the T-square (Curtis, S. 1999: Williams, G. Deacon, M. 1999). In the method of Roland, E. (2003) research was conducted assessing the geometric symmetry of the solar surface in thoroughbred cadaver limbs. It was found that the lateral aspect of the hoof was wider than the medial by a mean of 1.8mm.

Observations of the feet of horses that had complex foot and limb conformation showed signs of sole collapse in the medial seat of corn (SoC) region. The sole became convex, in the medial heel and quarter region (Figure 1). This has been called 'medial low' or medial arch collapse (Deacon, M. 2011). Medial low was observed in flat footed horses with a significant M/L foot imbalance and broken back hoof pastern axis (BBHPA).

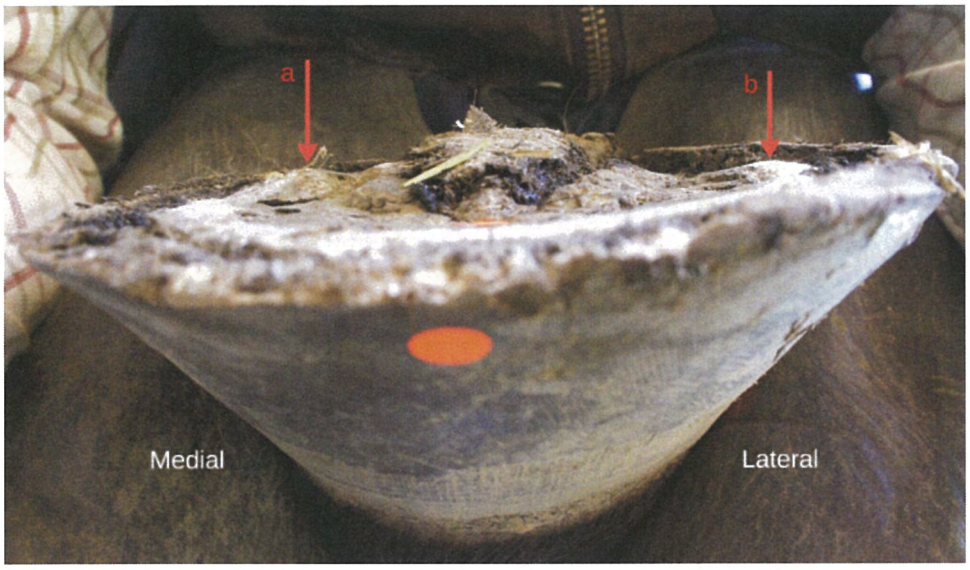

Figure 1: *The medial sole is convex and below the hoof wall (arrow a); compared to the lateral sole which is concave and above the hoof wall (arrow b).*

With the degradation of both the M/L and dorso-palmer (HPA) foot balance, descending forces are localised in the medial hoof causing the breakdown of attachment between sole and hoof wall, under-development of horn and solar asymmetry. If allowed to progress with no focus on supporting and restoring foot imbalances and the medial solar arch, vascular restriction to the solar corium may occur, the sole becomes thinner and begins to bear body weight directly and lameness can result (Dollar, J. and Wheatley, A. 1898: Williams, G. and Deacon, M. 1999). Further to this, the hoof can distort and twist around a vertical axis to compensate for poor M/L foot balance that has not been addressed over a prolonged period of time (Reilly, J. 2006). To rebalance feet, a redistribution of force is required to alleviate overt pressure on the medial aspect of the foot, transferring it to the rest of the foot therefore engaging the whole hoof capsule (Deacon, M. 2015).

Horses with both conformational faults and poor M/L foot balance, in regular, demanding work could be predisposed to lameness due to the uneven and excessive stresses placed on the limb, joints and the foot. A misaligned limb combined with increased workload has a detrimental effect on the hoof by increasing the already present conformational fault (Parks, A. H. 2011).

Trimming to reduce M/L imbalance reduces the duration of loading when the foot is under maximum load therefore increasing the speed with which the shoe supports the foot (Heel, M. C. V. 2004), therefore foot trimming, shoe type and placement on a poorly conformed limb/foot may reduce uneven stress through the foot and joints of the limb. If stability were achieved through this process, it would lead to a more even distribution of force either side of the vertical axis, subsequently reducing the degree of distortion of the horses' foot.

It is important to observe how the foot lands, loads and takes off from the ground from both dorsal and palmer views. Specific shoes may be considered when attempting to restore the medial arch and sole concavity. The Heart Bar shoe has been documented as a useful shoe in reducing the descent of the sole by engaging the frog. The Half Heart Bar shoe is designed to increase the area of support typically on the medial aspect of the foot (Williams, G. and Deacon, M. 1999).

This study was carried out in response to the authors observations of horses' feet that had complex foot and limb conformation displaying signs of sole collapse in the medial seat of corn (SoC) region. The study focusses on M/L imbalance and solar asymmetry as the main criteria of assessment, although dorso-palmer balance will be considered a contributing factor affecting M/L balance and solar symmetry. It constitutes farriery involving five horses with laterally offset hoof capsules, M/L hoof imbalance and hoof asymmetry. These five cases represent a purposeful sample of a wider population of horses displaying significant M/L imbalance and solar asymmetry. Each case study was chosen to demonstrate a different degree of severity found within the wider demographic.

Aims and Objectives

The aim of this study was to examine different methods used to correct M/L imbalance and solar asymmetry. The objectives of this study over a one year period were:

1. To record predisposing conformation both static and dynamic
2. To record the clinical signs at initial shoeing
3. To assess and record the development of the hoof capsule pathology in particular the medial seat of corn region throughout study
4. To record the M/L balance of the front feet
5. To record the M/L symmetry of the front feet
6. To record the shoe type used and its effectiveness

Ethical Considerations

The four main principles of ethical conduct, beneficence, autonomy, non-maleficence and justice, as applied to research were utilized in the study. Owners of the five horses were fully informed verbally and in writing of the aim of the study. This was to ensure understanding of the study's requirements and the commitment of both parties to the horses' welfare and best interests. Consent forms were given to owners and their right to withdraw their horses at any time explained (appendix i). All information of horse and owner was kept in a secure locked cupboard to protect confidentiality. All material and data collected had identifying information removed before publication therefore ensuring anonymity.

Shoeing Plans and Data Collection/Tools

Careful consideration was given to the individual requirements of each horse through a detailed review of its shoeing history and history of soundness related specifically to foot problems. It was decided that individual horses would need to be trimmed and/or shod according to their need rather than choosing one shoeing plan and applying it to all horses.

The five horses selected for this study were chosen for their foot and limb conformation, their M/L imbalance, and the solar asymmetry of their front feet. Each horse was shod on a five week cycle; a record was kept of their diet, exercise, turnout time, any hoof products applied and type of exercise. Further to this information a detailed record of the hoof was made at each shoeing (appendix ii).

To record M/L balance a variation of the T-square was used by this author in this study. Traditionally the T-square has a long and short axis which are fixed at 90^0 in a T shape. The author designed and used a T-square with an adjustable bar which was lined up with both heels to the long axis of the limb. This gave readings of M/L imbalance in the untrimmed and trimmed foot in millimetres (mm).

When using the flexible T square to measure M/L imbalance, each measurement was checked three times before being recorded. All horses were shod in the same place and on the same surface each time and photographed in the same way for each photograph. M/L balance was assessed statically by holding the forelimb under the flexed carpus, allowing the foot to hang freely (Figure 2). An imaginary line, known as 'eyelining' (Figure 3) was viewed along the palmar aspect of the third metacarpal (the long axis). A further imaginary line was viewed across both heels of the foot, which in the ideal foot would bisect the long axis at right angles (Curtis, S. J. 1999). The foot is considered 'imbalanced' medio-laterally when this line across the heels is not at right angles to the long axis. Foot balance was assessed dynamically by viewing the horse at walk in a straight line on a hard, level surface both walking away and towards the assessor.

Figure 2: *Assessing M/L balance. Using the flexible T square to record the angle of the heels to the long axis of the limb.*

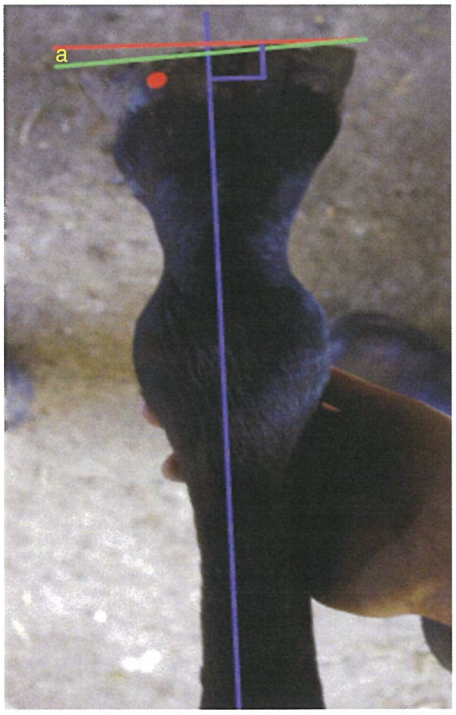

Figure 3: *'Eyelining' the imaginary line used to assess medio-lateral foot balance using the long axis (blue line) the ideal (red line) and actual line of the heels (green line); a) is the difference between ideal and actual.*

To evaluate the forelimb conformation, a line known as the vertical axis was imagined from the centre of the metacarpo-phalangeal joint continuing distally through the pastern and hoof. If this vertical axis did not bisect the hoof evenly the hoof was considered to be offset either medially or laterally (O'Grady, S.E. 2014).

Solar symmetry was defined as the shape of the foot on the bearing surface. This was evaluated using an axis through the central sulci of the frog. The frog is positioned centrally on the solar aspect of the foot positioned directly under the skeleton of the forelimb.

The shoes were removed, and loose hoof removed. Each horse was trimmed to try and achieve M/L balance relative to the long axis (Figure 3) and to restore solar symmetry. The M/L foot balance was measured using the flexible headed T-square pre and post trimming. Following shoe removal the T-square was aligned with the long axis of the limb and the T-bar was aligned to both medial and lateral heels (Figure 2). The flexible T-square was placed on a T shaped template and measured against it. The lateral side of the T-square was measured in millimetres (mm). It was trimmed and again the M/L balance was measured and recorded.

The foot was photographed pre-trim and post trim (Appendix iii). Photographs were taken using a Sony Nex 5 Camera[1]. Photography was used to record; SA, forelimb conformation from dorsal, lateral and palmar aspects, long axis of the limb, solar plane of the hoof, medial arch collapse and distortions of the hoof (Figure 4).

Figure 4: *The author recording the RF dorsal view of case study 4.*

A vertical axis was added to the photographs using prezi[2], enabling the creation of a consistent datum line from which specific measurements were taken. These were used to measure the level of displacement and distortion of the hoof capsule (Figure 8: a.b.c). Dorsal, palmar and solar photographs of the foot were calibrated using 8mm self-adhesive circular labels[3]. Measurements of the photographs taken used a commercial software programme EponaTech Metron Hoof[4]

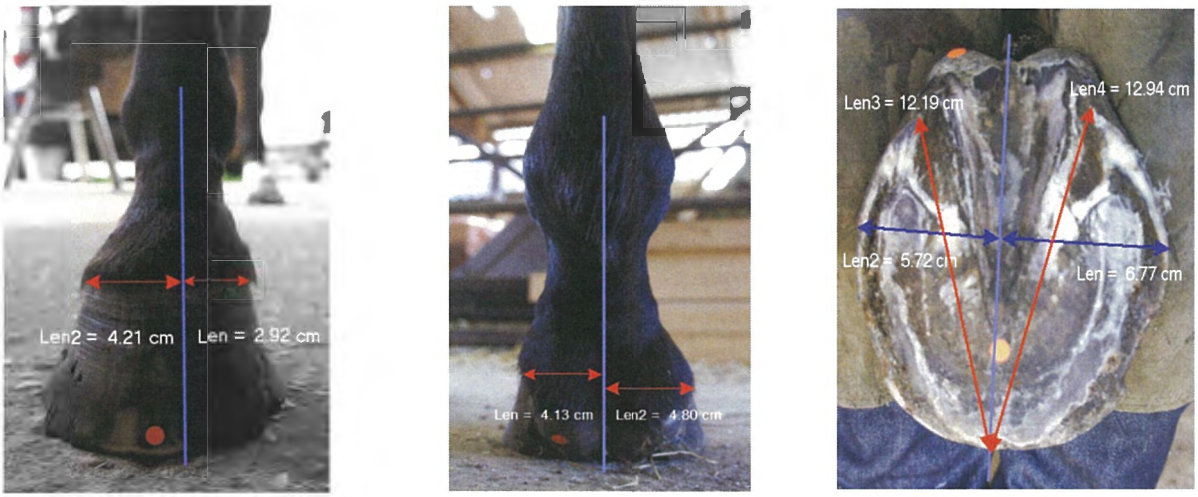

Figure 5: *a) dorsal view, b) palmer view, c) solar view showing datum line in blue with measurements in red and blue arrowed lines.*

Shoeing Method

Shoe type and application was selected for the individual fore foot of each horse. At every shoeing, depending on the response to the previous shoeing, the foot trimming and shoeing was adapted. Different shoe application methods where used throughout the year when required. Additionally there were differences: in the materials that the shoes were made from (aluminium or mild steel), size of section, clipped or not, position of clip, and whether thinning of the lateral toe quarter and easing of breakover was required.

The method of shoe application was different for each case study, but all the horses were hot shod using handmade shoes. According to the development of the foot from the previous shoeing a decision was made on which type of shoe was to be applied and how it would be fitted. Although different methods of application were used there were certain

consistent elements having the aim of developing and supporting the medial foot. Solar symmetry was identified by a central axis through the frog used as a guide for shoe orientation and positioning, the HPA was used as the guide for length of the shoe and dorso-palmer views used as a guide for M/L limb balance (Figure 6 a.b.c.d). e.g, with a horse that has a lateral rotation of the forelimb the shoe would be rotated medially around its vertical axis and positioned medially. In the horse that has a medial deformity (toe in) the opposite method would be required with the shoe rotated laterally around its vertical axis and positioned laterally.

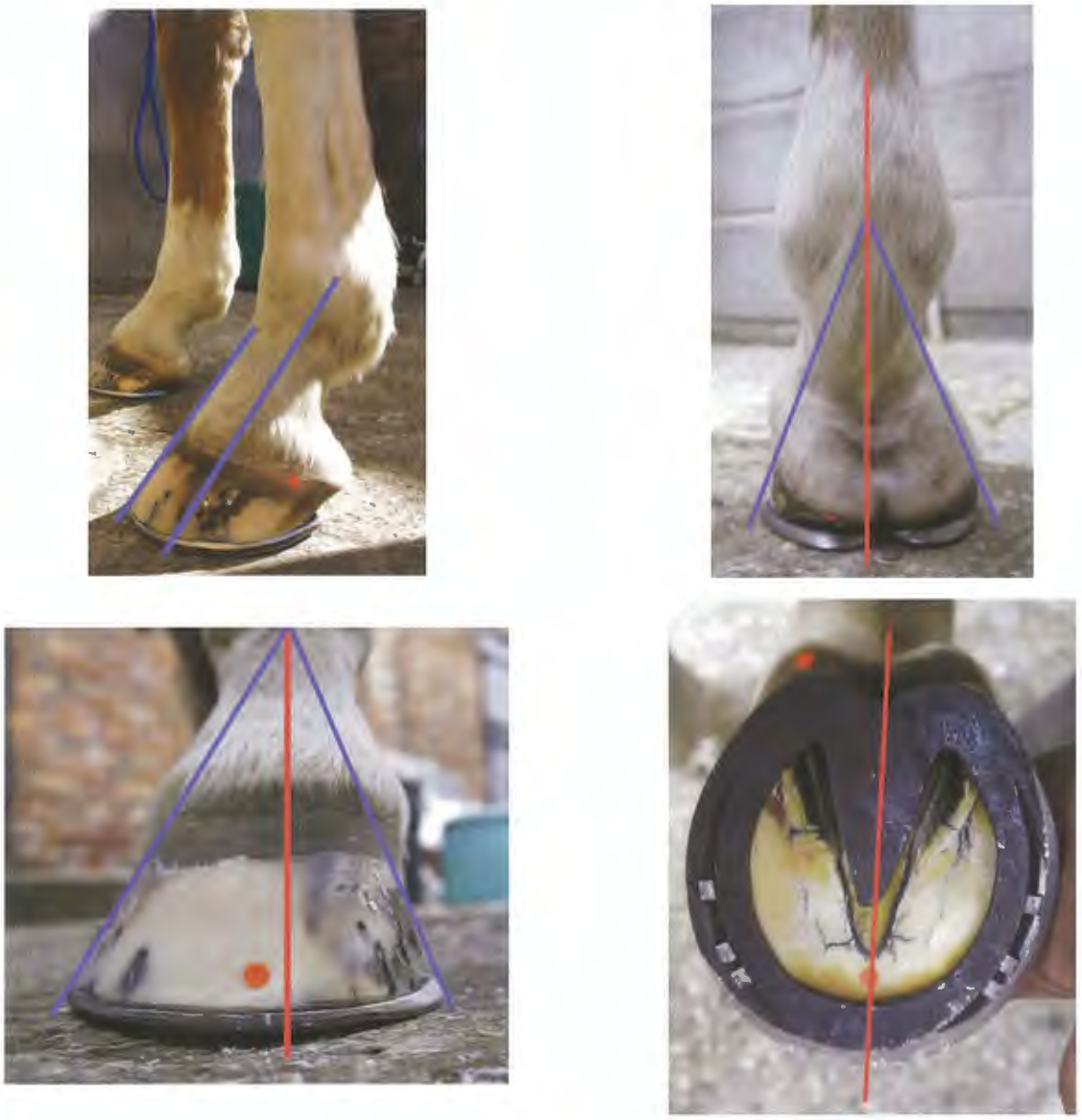

Figure 6: *Showing photographs with axis' of foot balance. These axis' formed guide lines for shoe positioning on the foot relative to the conformational faults e.g. Heart bar shoe rotated medially therefore frog plate not aligned with the direction of the frog: a. HPA, b. Palmer view, c. Dorsal view, d. Solar view.*

Shoe Type and Reason for Application

Shoe Type 1: Open Heeled Shoe (OH)

The section of the material was the same thickness across the shoe. It was fitted with medial support (width) and used where minimal support and correction were required (Figure 7).

Shoe Type 2: Open Heeled Medial Spiral Lift Shoe (OHMSL)

The medial heel of the shoe was the highest point gradually reducing in thickness to the lateral toe/toe quarter which was the thinnest point before slightly increasing in thickness at the lateral heel. This was applied where M/L foot balance was difficult to achieve and/or there was excessive unlevel strike and loading of the foot during stride (Figure 8).

Shoe Type 3: Half Heart Bar Shoe (HHB)

The section of material was the same thickness across the shoe. This was applied where an increased bearing surface on the medial aspect of the hoof and/or pressure relief on the medial heel/heel quarter was required (Figure 9).

Shoe Type 4: Heart Bar Shoe (HB)

The section of material was the same thickness across the shoe. This shoe was applied where strong caudal support was required and used for engaging the frog via the frog plate to prevent collapsing of the heels. M/L shearing forces are also reduced using this shoe (Figure 10).

Shoe Type 5: Medial Spiral Lift Bar Shoe (MSLB)

This shoe was the same as shoeing method two but with a straight bar joining both heels. The bar was graduated from medial heel to lateral heel. This shoe was applied where M/L foot balance was difficult to achieve and/or there was excessive unlevel strike and loading of the foot during stride. The 'bar' reduced M/L shearing forces (Figure 11).

Shoe Type 6: Heart Bar Shoe with a 'Float' in the Medial Heel Quarter (HBMF)

The section of material was the same thickness across the shoe until the medial heel quarter. At this point the shoe was thinned to half the original section. This shoe was applied initially where medial arch collapse was present. Similarly to the heart bar shoe, the frog was engaged via the frog plate. The 'float' in the shoe allowed the medial heel to sit on a supportive cushion provided by arch support material[5] (Figure 12).

Figure 7: *Shoe type 1: Open heeled shoe*

Figure 8: *Shoe type 2: Open heeled medial spiral lift shoe*

Figure 9: *Shoe type 3: Half heart bar shoe*

Figure 10: *Shoe type 4: Heart bar shoe*

Figure 11: *Shoe type 5: Medial spiral lift straight bar shoe with arch support material*[5]

Figure 12: *Shoe type 6: Heart bar shoe with floating medial heel/quarter (Arrowed)*

Data Analysis and Results

This study observed and recorded visual changes over a twelve month cycle. Whilst some data was recorded and proved useful in determining change over the study period there was not enough statistical power in the data for statistical testing. However where possible data was analysed using combined data from which limited results were obtained.

From the five horses studied, three left fore feet increased their medial surface area with two decreasing. In the right fore feet, four increased their medial surface area with one decreasing (Table 1). The whole area increased in all horses during the study period from a mean of 153.35cm^2 to 174.44cm^2 (p=0.033). Following the trimming protocol there was an improvement in the M/L balance in both LF and RF; LF untrimmed was 9.7mm to trimmed 3.27mm (p=0.001); RF untrimmed was 9.82mm to 3.59mm (p=0.001).

Table 1: Solar Surface Area Measurement Record

Horse	Date	LF whole Area	LF Medial area	LF Lateral Area	LF Medial Area %	RF Whole Area	RF Medial Area	RF Lateral Area	RF Medial Area %
1	Oct 14	171.28	85.93	83.66	50.17	204.31	101.12	99.37	49.49
1	Sep 15	149.27	77.59	71.76	51.98	175.41	82.19	92.39	46.86
2	Oct 14	116.74	60.60	57.99	51.91	128.03	56.85	71.05	44.40
2	Sep 15	148.90	75.28	70.34	50.56	117.33	58.04	58.78	49.47
3	Oct 14	156.73	77.16	74.13	49.23	191.90	88.14	102.76	45.93
3	Sep 15	218.53	109.76	107.25	50.23	222.01	106.14	113.34	47.81
4	Oct 14	131.27	66.89	65.50	50.96	134.39	64.94	70.01	48.32
4	Sep 15	167.40	89.03	77.84	53.18	181.73	92.20	90.56	50.73
5	Oct 14	134.66	69.83	67.01	51.86	164.17	76.37	89.90	46.52
5	Sep 15	186.24	93.97	96.36	50.46	177.60	86.73	89.71	48.83

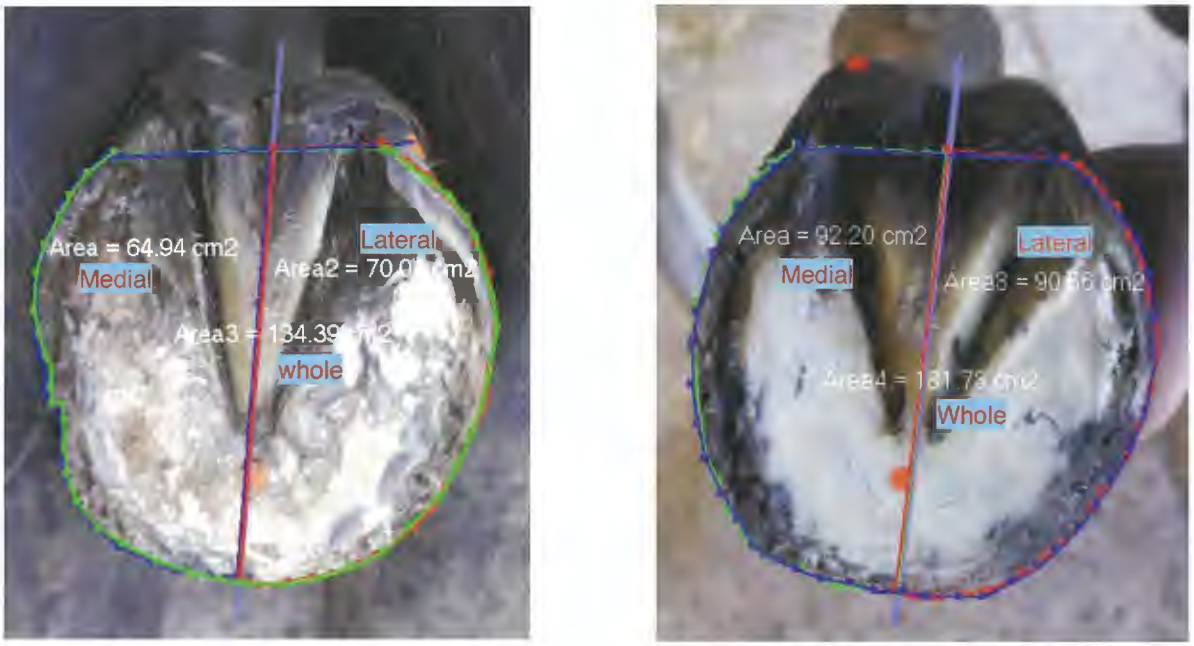

Figure 13: *Photographs showing how the three (Whole, Medial and Lateral) solar surface area measurements were recorded of the same foot at the start and end of the study. a. RF October 2014, b. RF September 2015.*

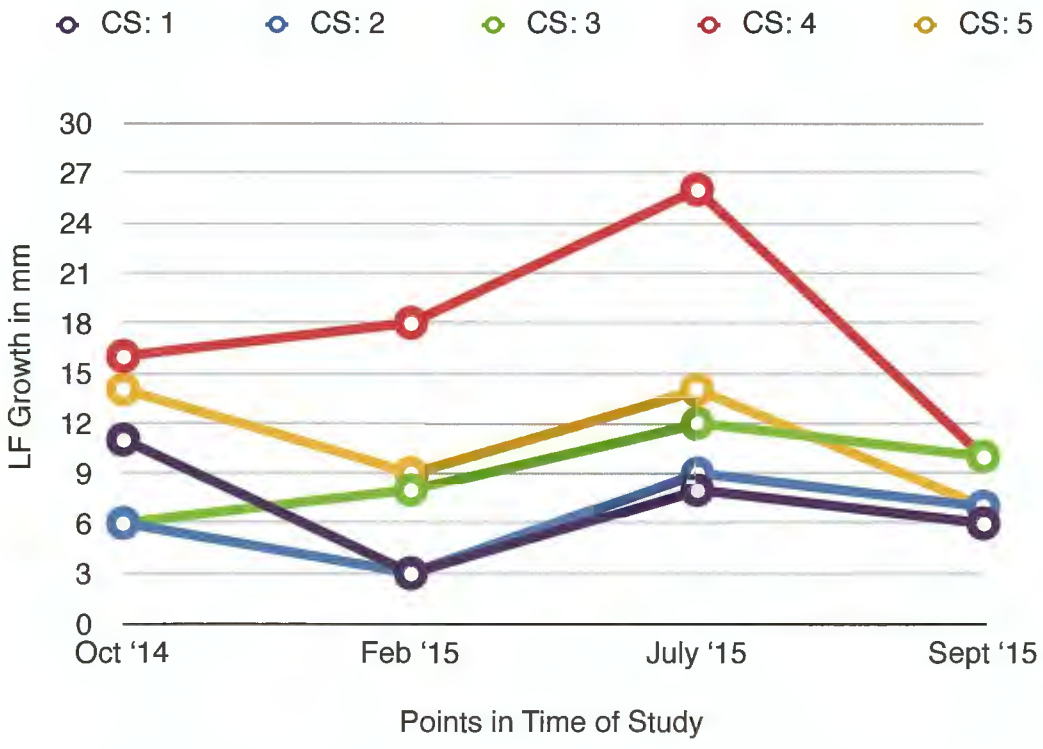

Figure 14: *A representation of the LF untrimmed M/L balance. It shows seasonal growth records over a 12 month cycle.*

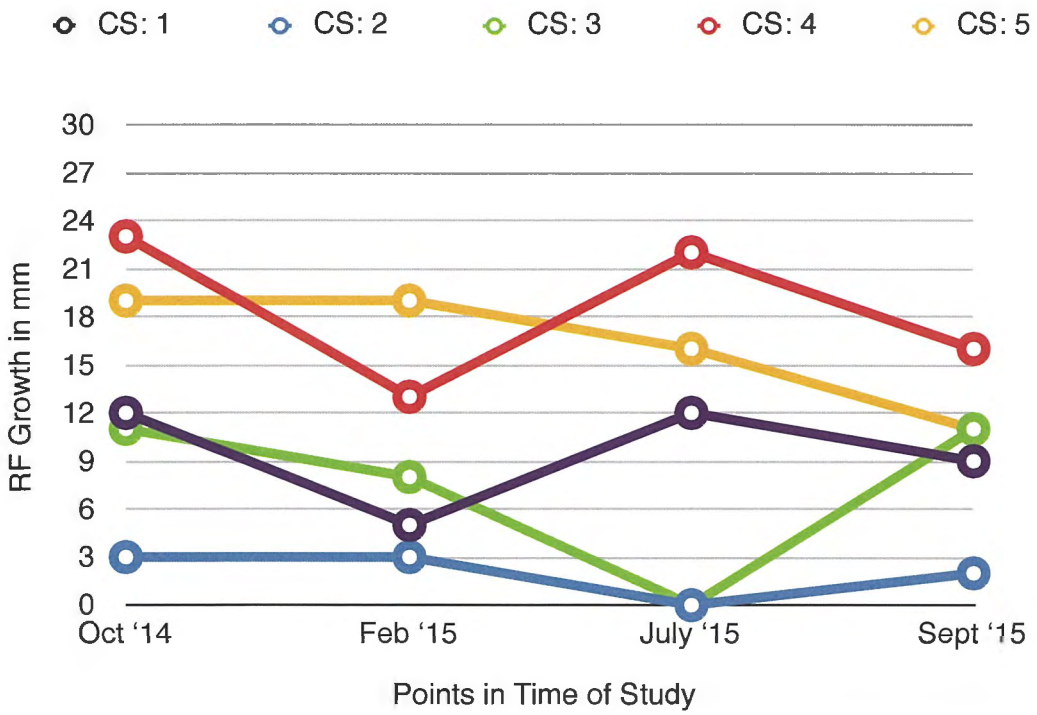

Figure 15: *A representation of the RF untrimmed M/L balance. It shows seasonal growth records over a 12 month cycle.*

Figures 14 (LF) and 15 (RF) show four dates chosen to represent the start of the study, the minimum growth period, the maximum growth period and the end of the study.

Figure 14 represents the findings of M/L imbalance in the LF of all cases. Three cases show a decrease in M/L imbalance at February 2015 (minimum growth) with the other two increasing in their imbalance. All five cases showed an increase of M/L imbalance in July 2015 (maximum growth) before reducing again by September. Overall three of the cases showed a decrease between initial and last recording.

Figure 15 represents the findings of M/L imbalance in the RF of all cases. Three cases showed a decrease in M/L imbalance at February 2015 (minimum growth) with the other two staying the same as at the initial recording. Two cases showed an increase of imbalance in July 2015 (maximum growth) whilst the other three cases showed a reduction. From July three cases reduced in imbalance to September with the remaining two increasing. Overall four cases had a reduced M/L imbalance between initial and final shoeing with the fifth case remaining the same.

Individual Case Study Programme and Progression

Case Study 1:

There was a history of forelimb lameness which was present at the start of the study. Minimal visible signs included: M/L foot imbalance, vertical medial heel displacement and slight solar asymmetry. Dynamically this horse had a distinctive primary strike, secondary load action during movement. Both forelimbs were laterally rotated and carpal valgus.

Radiographs showed a BBHPA and some exostosis to the DIPj. Two factors needed addressing; 1. Stabilisation of the foot landing and loading, 2. Realigning the HPA to reduce the unstable and unequal forces placed on the foot and DIPj. Shoeing method two (Open Heeled Medial Spiral Lift Shoe) was used from October 2014 - April 2015 when the horse was retired due to ongoing lameness and had its shoes removed. It was trimmed on a five week cycle and M/L balance and solar symmetry were recorded. An improvement was seen in the LF with both medial surface area and M/L imbalance improving. The RF showed deterioration of the medial surface area but improved M/L imbalance.

Case Study 2:

There was a history of occasional intermittent lameness on the LF. This case displayed visible clinical signs of M/L foot imbalance, solar asymmetry, poor quality hoof wall on the medial aspect. Palpation of the medial SoC on the LF caused a pain response. There was also medial heel and bar collapse. Dynamically this horse had a visible lateral primary strike with secondary loading on the medial aspect observed at walk. Both forelimbs were laterally rotated, with a lateral deviation from the metacarpo-phalangeal joint on the RF with both forelimbs having a laterally offset hoof capsule which was more significant on the LF.

Primarily it was important to stabilise the M/L foot imbalance, with a longer aim of strengthening the medial aspect of the foot enabling positive development of the medial heel, bar, hoof wall and solar arch. Shoeing method one (Open Heeled Shoe) was used from October 2014 - May 2015. From this time the LF required more support to alleviate the medial SoC region so shoeing method four (Heart Bar Shoe) was applied while the RF continued to be shod using method one. The LF showed deterioration in the medial surface area and the M/L imbalance during the course of this study. The RF improved both in the medial surface area and the M/L imbalance.

Case Study 3:

There was a history of forelimb lameness which lead to a neurectomy in 2011 to the RF foot. At commencement of this study the horse was sound. A number of clinical signs were visible; including M/L foot imbalance, solar asymmetry, which was more pronounced on the RF, a weakened hoof wall on medial aspect, bruising in medial bar and SoC region, vertical deviation of medial heel bulb, and medial heel and bar collapse. Dynamically this horse had a visible lateral primary strike with secondary loading on the medial aspect of the hoof, more exaggerated on the RF. This was dictated by the forelimb conformation, both forelimbs having a lateral rotation, and a lateral deviation from the metacarpo-phalangeal joint on the RF. Both fore feet had laterally offset hoof capsules and asymmetry in shape and size between right and left fore.

Factors that needed addressing were; M/L imbalance, vertical medial and lateral shearing forces and solar asymmetry. Treatment focused supporting the medial aspect of the foot and restoring solar symmetry through trimming and positioning of the shoe. This allowed positive development of the medial hoof wall, heel and bar therefore reducing pressure localised on the medial SoC region. Shoeing method four (Heart Bar Shoe) was applied from October 2014 - April 2015. From April to August shoeing method one (Open Heeled Shoe) was used until it changed back to method four for August and September. The LF showed an improvement in the medial surface area but overall a deterioration of the M/L imbalance. The RF showed improvement of the medial surface area but no change to the M/L imbalance.

Case Study 4:

This horse had no history of forelimb lameness. At the commencement of this study the horse was sound but unemployed. However this case displayed numerous significant clinical signs which included; severe M/L imbalance, solar asymmetry, poor quality weak hoof wall on the medial aspect, medial arch collapse particularly in the LF, breaking of the hoof wall in the medial heel, and medial heel and bar collapse.

Statically this case appeared to have 'toe in' stance. Dynamically there was a very slight lateral strike, secondary load on the medial aspect of the hoof, which was more visible on the RF. Significantly, as the descending body weight force travelled distally through the forelimb, the metacarpo-phalangeal joint descended over the medial aspect of the hoof localising pressure over the medial heel and quarter. The forelimb conformation was

complex with both forelimbs being laterally rotated, carpal valgus, and a valgal deviation from the metacarpo-phalangeal joint and laterally offset hoof capsules. Both feet appear rotated medially particularly when viewed palmarly with a medial spiral twist in the pastern on the RF.

Various factors needed addressing including; M/L foot imbalance, stabilising it initially with a focus on reducing the imbalance long term. It was not possible to achieve M/L balance to the long axis from trimming alone, therefore shoeing method two (Open Heeled Medial Spiral Lift Shoe) was chosen initially to achieve M/L balance. This method was used until February 2015 and then changed to method three (Half Heart Bar Shoe) until May 2015. In May the method changed to two until June when it changed to method four (Heart Bar Shoe). This continued until the end of the study but with arch support material[5] added in from July. Both left and right fore feet showed improvement in both aspects. Both feet improved their medial surface areas and the M/L imbalance improved.

Case Study 5:

There was a history of lameness in the RF. At the commencement of this study the horse was sound and in general riding work on hard and soft surfaces. This case displayed significant and complex clinical signs including; severe M/L imbalance, excessive solar asymmetry in the RF particularly, split frogs, RF - dominant over-developed lateral aspect of the hoof, under developed medial aspect of the hoof, and poor quality weak hoof wall on the medial aspect. Both the RF and the LF, showed medial arch collapse, particularly in the RF, breaking of the hoof wall in the medial heel and quarter, and medial heel and bar collapse.

Statically this horse had a toe out stance with the coronary bands of both fore feet descended disto-medially indicating M/L imbalance. Dynamically this horse had an obvious lateral strike secondary load on the RF with a slightly less distinct but similar movement on the LF. Significantly, as the descending body weight force descended through the forelimb, the metacarpo-phalangeal joint descended over the medial aspect of the hoof focusing pressure over the medial heel and quarter. The forelimbs had numerous and complex faults. Both forelimbs had a lateral rotation, the RF also had a valgal deformity from the metacarpo-phalangeal joint and laterally offset hoof capsules. Viewed laterally this horse had a BBHPA.

Various factors needed to be addressed; M/L foot balance needed to be stabilised initially with a focus on reducing the imbalance long term. Shoeing method one (Open Heeled Shoe) was used from Otober 2014 - December 2014 when method four (Heart Bar Shoe) was applied to both fore feet.

In January 2015 the methods changed for each foot. The LF continued to be shod with method four and arch support material[5] until the end of the study. The RF was shod using method six (Heart Bar Shoe with Medial Float) with arch support material[6] until March. From March the method changed to five (Medial Spiral Lift Bar Shoe) with arch support material[6] until August. From August method four with arch support material[6] was used until the end of the study. The LF showed a deterioration in the medial surface area but an improvement of the M/L imbalance. The RF showed improvement in both aspects, the medial surface area improved and the M/L imbalance improved.

Discussion

The study was instigated by the increasing problems of collapsed medial arches, severe M/L imbalance and solar asymmetry in horses referred to the authors' client base. Five horses were selected as representative sample of the continuum of mild to severe foot imbalance. All the horses had conformational challenges and laterally offset feet. An initial assessment of each horse which included conformation, lameness and shoeing history was undertaken and individual shoeing plans developed. Observations and measurements were taken and recorded at each shoeing and the shoeing plans adjusted accordingly.

In order to ensure the seasonal changes in foot growth were accounted for it was decided to carry out this study over a twelve month period commencing autumn/winter 2014. The weather for spring and summer 2015 was consistently dry for long periods which influenced the feet in two ways: Firstly, there was a good hoof growth; Secondly, the quality of the hoof wall improved due to the consistency of the environment. The effect on the foot balance/hoof development of these horses over the twelve month period showed both positive and negative outcomes in relation to times of minimum and maximum growth. Continually evaluating and adapting the shoeing plans throughout the study ensured some control in preventing excessive imbalances developing.

In choosing the material for each shoe consideration was given to the balance of weight of the shoe which ultimately influenced the choice of material used, for example., an Open Heeled Medial Spiral Lift shoe has more material in the medial heel and branch compared with the lateral toe and branch which can cause the shoe to be unbalanced in its weight distribution. With shoe type 6 (Heart Bar Shoe with Medial Float; Figure 12) using aluminium with a section significantly thicker allowed for the 'float', with steel this would have made the shoe too heavy for the horse. Aluminum does allow for an increase in section size to be used without the penalty of weight. One significant problem observed during this study was the lack of strength of aluminum relative to both the shoe distorting under load and the increased wear in the shoe by the heels on the foot surface.

Horses displaying these conformational faults have indicators in the foot highlighting a greater problem of excessive forces being unevenly dissipated through the foot and its associated structures. It is essential to take into consideration these indicators along with a detailed limb and foot conformation assessment. The three planes of foot balance have to be closely managed and controlled if improvement is to be made. Awareness seasonal growth patterns, controlling the shoeing cycle on five weekly intervals and reducing the length of time in which the foot becomes imbalanced before being rebalanced, is vital. Over the course of this study the quality and strength of the medial hoof developed positively as excessive loading force was redistributed from the localized medial area to the whole foot. From the results of specific trimming and shoeing plans it is clear improvements can be made to the medial aspect of a laterally offset hoof.

The implications from this study highlight the need for excellent evaluation and analysis of the foot and reading of the signs of degradation in the medial hoof, for example., bruising in the medial SoC region and bar, excessive M/L imbalance, solar asymmetry, crushed and collapsed medial heel and bar, thinning of medial hoof wall, breakdown of hoof quality on medial aspect and medial low. Following a sound and informed assessment, shoeing plans can be formed with the focus of redistributing uneven load throughout the whole hoof. This may lead to soundness where lameness is present, increasing the longevity of the horses working life, ultimately improving the welfare of the horse.

The case study approach has both limitations and strengths in relation to sample size. With regard to data collection for statistical analysis five cases did not provide sufficient statistical power for an in depth analysis or to draw specific conclusions. However for

horses that have problems of collapsed medial arches, severe M/L imbalance and solar asymmetry combined with conformational faults, individual case studies allow for an in depth exploration of cause and effect in relation to the evolving, adaptation and implementation of shoeing plans.

Data collection was consistent, measured three times for each reading. There can be discrepancies amongst farriers in how they align the long axis and how the limb is held for assessment. Although this study demonstrated that some elements of foot balance can be measured accurately it still remains a subjective art rather than an exact science. Measuring the angle of limb deformity and/or rotation was not possible making it difficult to accurately record any changes throughout the limb and to gauge if there was a correlation with improvements within the foot.

The reliability and validity of the tools used for assessment and recording varied. The tools used to record the foot; flexible T-sq, camera, photography software enabled the author to keep an accurate record of hoof development at each appointment and to analyse it. This proved useful when comparisons were required between the start and end sessions and at various relevant points throughout the study. The records made, informed the results of this study and evidenced the observational changes in the horse's feet.

The flexible T-square worked well and data was valid but a similar device with a digital measuring device applied would increase the accuracy and reliability/consistency of measurement of this tool. The calibration markers used when photographing the foot proved too small to allow for absolute accuracy when calibrating the photographs. This meant all measurements had to be taken from same photographs at the same time before it was exported from the programme. The software programme itself was reliable.

Variable factors that were recorded at each shoeing including: turnout time, feed type, supplements and whether any hoof products were applied, were consistent. Due to the small size of the case studies it was not possible to gauge their effect on the feet and showed no difference throughout the study. Further research in this area may be useful.

Conclusion

With all farriery it can be said 'no one size fits all' but it is more apparent when shoeing horses with laterally offset hoof capsules. Each case requires a flexible and unique approach considering all the individual variables. This approach to forming a shoeing plan benefits horses with laterally offset hoof capsules, M/L imbalances and solar asymmetry. Constant monitoring and adaptation of the shoeing plan is required at every shoeing. Significant improvement in reducing foot imbalances can be achieved at each shoeing but long term consistency can be unsustainable.

Manufacturers Address

1. Sony Nex 5 - Sony Europe Limited, The Heights, Brooklands, Weybridge, Surrey, KT13 OXW, United Kingdom
2. Prezi - Prezi Inc, Karen Tang, 633 Folsom Street, 5th Floor, San Francisco, CA 94107
3. 8mm Self Adhesive Markers - Staples Direct, PO Box 732, Doncaster, DN3 1WR
4. Metron EponaTech - EponaShoe P.O. Box 361 Creston, CA 93432
5. Equipak - 600 E. Hueneme Road, Oxnard, CA 93033

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Appendices

Appendix i
Dear Horse owner,

I am currently developing a case study approach to the trimming and shoeing of horses who display foreleg conformational deformities. It has been my interest for a number of years and through practical experience I have found that laterally offset hoof capsules appears to result in medial arch collapse in the hoof.

Therefore I intend to invite owners of horses with this specific conformational deformity to be included in this study.

With regard to my request to include your horse as part of a case study approach to my Fellowship of the Worshipful Company of Farriers dissertation, I have put together the following details.

Details of study:

1. The names of horses and owners will be anonymized to ensure anonymity and confidentiality.

2. All information and photographs/recording material will be stored in a secure cupboard.

3. The study will commence on the 1st October 2014 and complete on 30th September 2015.

4. The horses will be subject to trimming and shoeing on a 5 week cycle.

5. A process of trimming and shoeing will be used as appropriate to the individual horse, with its welfare and best interest as the core of my decision making

6. If the above requires the use of materials not normally used as of 1st October 2014, e.g, bar shoes, Equipak; then I will meet the extra cost of these.

7. The need for any technical changes to the trimming and shoeing plans during the study will be fully explained to the owners and their agreement obtained.

8. The use of photographs and video recordings will be utilized as a means of recording the process, along with a comprehensive checklist at each trimming and shoeing.

9. A copy of the dissertation/case study will be made available to the owner.

10. It is my intention that parts of the paper will be submitted for inclusion in appropriate publications.

If you are satisfied with the terms as laid out in this letter and would consent to your horse participating in this study, please sign and date below.

Thank you,

Farrier,

Owner:

Date:

Appendix ii

Appointment Date	
Client Name	
Horse Management	**Comments**
Feed type and how much; any supplements?	
Turned out - how long for etc	
Any hoof products applied; how regularly?	
Type of work	

Hoof Observations	**Left Fore**	**Right Fore**	**Comments**
Untrimmed foot measurements: Width: Length: Heel Width: Frog Length:			
Condition of hoof wall			
Mediolateral foot imbalance?			
Solar asymmetry?			

Hoof Observations	Left Fore	Right Fore	Comments
Hoof Pastern Axis, straight?			
Medial heel and quarter condition			
Dorsal hoof wall flare - Where and how much			
Heel bulb position, shunted?			
Lost either front shoes in last shoeing cycle			
Bruising in seat of corn and/or medial bar region			
Arch collapse in medial seat of corn			
Bar collapse on medial aspect			

Hoof Observations	Left Fore	Right Fore	Comments
Condition of frog			
Any further observations			

Appendix iii

Date		
Client Name		
Horse stood on hard surface?		
View of Video Before Shoeing	**Done**	**Comment/s**
Dorsal		
Plantar		

View of Photograph of Before Trimming	**Done**	**Comment/s**
Lateral of both front feet		
Dorsal of both front feet		
Solar of both front feet		
Plane of both front feet (from toe to heel)		
Heel bulbs of both front feet		
Palmer of both front feet		

View of Photograph After Trimming	**Done**	**Comment/s**
Lateral of both front feet		
Dorsal of both front feet		
Solar of both front feet		
Plane of front feet (from toe to heel)		
Heel bulbs of both front feet		
Palmer of both front feet		

View of Photograph After Shoeing	Done	Comment/s
Lateral of both front feet		
Dorsal of both front feet		
Solar of both front feet		
Plane of shoe on foot (from toe to heel)		
Plane of shoe on foot (from heel to toe)		
Palmer of both front feet		

Appendix iv
Case Study 1

Horse Details	Comments
Age	16 years old
Height	14.3 HH
Weight	Approximately 480KG
Condition Score 0-5	4.5
Breed	Welsh Section D X Arab
Forelimb Conformation	Left and Right: Carpal Valgus with Lateral Rotation and Laterally Offset Hoof Capsules
Laterally Offset Hoof Capsule Measurement	Left fore: Right fore: (See figure _ in appendix)
Type of Work	None as currently being treated by Veterinary Surgeon for arthritis in DIPj
Environment	Free draining loam based soil
Diet	Grazing daytime, hay nighttime, chaff, sugarbeet and joint supplement

Shoeing History

Date of Shoeing	Comments
As of 1/10/14	Showing bilateral forelimb lameness. Lameness showing since start of May 2014. Shoes removed for two months June/July 2014 and turned away. Veterinary Surgeon examination end of July 2014 and following radiographs recommended shoes with an element of eased breakover due to broken back hoof pastern axis.
13/11/14	Continued bilateral forelimb lameness in DIPj still unresolved with rest and medication from the Veterinary Surgeon. Shoeing plan changed to medial spiral lift open heeled shoes to try and stabilise landing and loading.
17/12/14	Continued bilateral forelimb lameness in DIPj still unresolved with rest and medication from the Veterinary Surgeon. Mediolateral foot balance improved over last shoeing cycle.

Date of Shoeing	Comments
20/1/15	Continued bilateral forelimb lameness in DIPj still unresolved with rest and medication from the Veterinary Surgeon. Continued signs of improved solar symmetry, medio-lateral and anterior/ posterior foot balance. Strengthening on medial aspect of both front feet. Continued with medial spiral lift open heeled shoes.
24/2/15	Continued bilateral forelimb lameness in DIPj still unresolved with rest and medication from the Veterinary Surgeon. Shoeing plan continuing with medial spiral lift open heeled shoes.
31/3/15 - Sept '15	Continued bilateral forelimb lameness in DIPj still unresolved with rest and medication from the Veterinary Surgeon. Shoeing plan changed, horse was retired, shoes removed and it was turned away.

Case Study 2

Horse Details	Comments
Age	22
Height	15:3HH
Weight	473KG
Condition Score 0-5	4
Breed	Connemara X Thoroughbred
Forelimb conformation	Left fore: Slight lateral rotation of the limb, with a laterally offset hoof capsule. Right fore: Lateral rotation with a lateral deviation from the fetlock and a laterally offset hoof capsule.
Laterally Offset Hoof Capsule Measurement	Left fore: Right fore: (See figure _ in appendix)
Type of Work	Retired
Environment	Clay
Diet	Grass - turnout

Shoeing History

Date of Shoeing	Comments
10/10/14	Horse presented with asymmetric front feet. Left fore has a more sloping hoof pastern axis (HPA) and the right fore is more upright. Lameness was observed in right fore, after investigation pain was located in the medial seat of corn area. In this region pain was present on palpation of the sole from thumb pressure. The medial heel and bar were collapsed with a thinning of the hoof wall in the medial quarter and heel. There was a medio-lateral imbalance with the lateral aspect of the foot being longer than the medial when the foot was assessed using the long axis. Shoeing plan: Both front feet trimmed perpendicular to the long axis. Open heeled shoes applied with medial support and medially orientated around the foot
14/11/14	As previous, M/L imbalance gradually reduced. LF medial SoC region improved still thin but better than last time. Shoeing plan as previous

Date of Shoeing	Comments
19/12/14	M/L imbalance reduced slightly again. Trimming balanced to long axis achievable. Medial hoof continuing to strengthen and improve. Shoeing plan as previous
23/1/15	Minimal M/L imbalance in both. Both feet strengthening on medial aspect and trimming balanced to long axis. Shoeing plan to continue.
27/2/15	Minimal M/L imbalance in both. Both feet strengthening on medial aspect and trimming balanced to long axis. Shoeing plan to continue.
2/4/15	Increase in M/L imbalance in LF, slight collapse in medial heel and bar. RF still acceptable. Still able to trim to long axis to balance. Shoeing plan to continue
7/5/15	Continued increase in M/L imbalance in LF. Signs of further medial collapse and hoof distortion, hoof wall weakening in quality and strength. Still able to trim balanced to long axis but for LF more support required as its the 'flatter' foot. A heart bar shoe was applied to the left fore. This shoe was selected to achieve three aims. Firstly to apply some pressure to the frog therefore relieving the heels excessive pressure, secondly to offer more caudal support and thirdly to reduce the shearing forces placed on the foot. Right fore shod with open heeled shoe and continued to remain stable M/L and medial hoof quality better than LF.
7/5/15 - Sept '15	Improvement in the comfort of the horse LF and some strengthening of the sole in the medial SoC region. Limited improvement for LF from this point but improvement in RF M/L imbalance and medial hoof development. Shoeing plan continued as above.

Case Study 3

Horse Details	Comments
Age	13
Height	17.1HH
Weight	600KG
Condition Score 0-5	3
Breed	Irish Sports Horse
Forelimb conformation	Left fore: Lateral rotation with laterally offset hoof capsule Right fore: Lateral rotation lateral deviation from the fetlock joint with a laterally offset hoof capsule.
Laterally Offset Hoof Capsule Measurement	Left fore: Right fore: (See figure _ in appendix)
Type of Work	Hacking, Schooling, Dressage
Environment	Sandy
Diet	Safe and Sound, Happy Hoof, Super codlivine joint supplement

Shoeing History

Date of Shoeing	Comments
October 2007	Horse bought for BE eventing, dressage, hacking etc
September 2010	First signs of lameness in right fore
October 2010	Referred to Equine hospital - remedial farriery x 3
March - June 2011	Eventing, sound.
June 2011	Lameness reoccurs in right fore. Under investigation from Veterinary Surgeon at Equine hospital.
October 2011	Neurectomy to right fore
Apr 2013 to Sept 2013	Eventing, sound full season.
April 2014	Eventing, sound.
May 2014	Lameness reoccurs in right fore. Under investigation from Veterinary Surgeon at Equine hospital. Lameness continued until October 2014

Date of Shoeing	Comments
3/10/14	Coming back from DDFT injury in right fore. Medio-lateral slightly unstable in both front feet. Unusually the right fore is stable after a full shoeing cycle and the left fore is showing medial high. The feet are strong and the quality of the hoof wall is good. There is a definite ridge on the medial aspect of both feet which indicates the hoof is growing down more thickly. The horse has had its shoes removed for two shoeing cycles prior to coming back into work recently. This horse shows consistent corns and bruising on the medial seat of corn and the medial bar. Shoeing plan: Both feet trimmed to the long axis. Heart bar shoes were chosen to offer frog support due to DDFT injury and considering the horse is just coming back into work. Medio-lateral stability gained from the rigidity offered by using a bar shoe has helped reduce the bruising in the medial seat of corn and bar region previously. Right fore shoe had lateral toe quarter thinned to help the foot land and load level.
7/11/14	Minimal movement medio-laterally over the course of shoeing cycle. Slight shattering of horn in medial heels with some thinning of wall in medial quarter. Dorsal wall self maintaining well and remaining strong with minimal flaring. Bruising in medial seat of corn/bar region remains minimal. Shoeing plan: Both feet trimmed perpendicular to the long axis. Heart bar shoes applied again for reasons stated above.
12/12/14	Lameness in right fore following dressage competition. Increases instability medio-laterally of both fore feet. Right fore more significantly than left fore. Increased bruising on medial bar region in right fore foot. No bruising on left fore. Shoeing plan: Both front feet trimmed perpendicular to the long axis. Heart bar shoes as previous shoeing's for same reasons of support. Left fore fitted with quarter clips and right fore fitted with toe clip. Right fore is more contracted than left fore and quarter clips on shoes were starting to make foot very angular through quarters. It was decided to go to a clip to allow the natural shape of the foot to be restored.
17/1/15	Horse has been out of work following latest lameness issue. Feet have stabilized medio-laterally leading to less bruising on medial seat of corn/bar region. Shoeing plan: Both front feet trimmed perpendicular to the long axis. Heart bar shoes as previous and fitted as previous.
20/2/15	Horse brought back into light work working on a surface. Medio-laterally feet have destabilized with the increase in work. Bruising has appeared again on the medial seat of corn/bar region of the right fore. Shoeing plan: Both front feet trimmed perpendicular to the long axis. Heart bar shoes fitted as previous.

Date of Shoeing	Comments
27/3/15	Horse is regular work on a surface. Medio-laterally the feet are increasingly destabilized. Both front feet showing bruising in medial seat of corn/bar region albeit small. Shoeing plan: Both front feet trimmed perpendicular to the long axis. Heart bar shoes fitted as previous.
30/4/15	Horse in regular work on a surface. Medio-laterally the left fore is more unstable than the right fore. There is increased bruising found in the frog of both front feet. Left fore there is minor bruising in seat of corn/bar/ tip of frog region, right fore is significantly bruised in frog and at apex of frog on the sole. Shoeing plan: Both front feet trimmed perpendicular to the long axis. Heart bar shoes fitted as previous.
4/6/15	Horse out of work now due to rider unable to continue riding. Medio-laterally there is an increasing gap between left fore and right fore with left fore being worst. Bruising reduced in both feet. Symmetry of right fore improved compared to 3 moths ago. Shoeing plan: Both front feet trimmed perpendicular to the long axis. It was decided to choose open heeled shoes with a toe clip for both front feet due to how well they were self maintaining their dorsal hoof wall. From monitoring the feet the medio-lateral balance stabilizes and the bruising diminishes quite quickly when this horse goes out of work therefore it was felt there was not a need for heart bar shoe as previously.
9/7/15	Horse continues to be rested and out of work. Medio-laterally the left fore is following the usual pattern of stabilizing whereas the right fore is stable. Both continue to show small localized spots of bruising in caudal medial aspect of foot. Shoeing plan: Both front feet trimmed perpendicular to the long axis. Shoes refitted.
14/8/15	Horse continues to be rested and out of work. Medio-laterally the left fore is following the usual pattern of stabilizing whereas the right fore is stable. There is a marked increase in the bruising on the caudal medial aspect of the left fore. The medial heels of both front feet appear to be collapsing. Shoeing plan: Both front feet trimmed perpendicular to the long axis. It was decided heart bar shoes would support and spread the pressure through a greater bearing surface and relieving the medial heel and heel quarter.

Case Study 4

Horse Details	Comments
Age	12 Years
Height	17 HH
Weight	650KG
Condition Score 0-5	4.5
Breed	Hanovarian
Forelimb Conformation	Both: Slightly carpal valgus Left Fore: Lateral rotation lateral deviation from the fetlock and laterally offset hoof capsule Right Fore: Lateral rotation medial rotation in pastern and laterally offset hoof capsule
Laterally Offset Hoof Capsule Measurement	Left fore: Right fore: (See figure _ in appendix)
Type of Work	Hacking out, has competed eventing and dressage. Owner hopes to increase work load
Environment	Grass and clay
Diet	Grass and hay

Shoeing History

Date of Shoeing	Comments
Prior 1/1/13	Prior to this date the horse had no issues with soundness and competed successfully at elementary level dressage often winning. The horse came shod in open heeled quarter clipped front shoes. There was a significant medio-lateral imbalance at this stage. Various ways of shoeing were explored all producing no positive results in reducing the medio-lateral imbalance. The horse was sent away to be schooled and worked whilst owner/ rider was unable to. Had difficulty in keeping shoes on due to poor quality of his hoof walls in particular the medial quarter and heel. This was the summer with record levels of rainfall in the UK and a lot of horses struggled with hoof wall separation. Tried some glue on shoes but they failed to improve the quality of the hoof wall.

Date of Shoeing	Comments
1/1/13 - 13/6/14	Horse was unshod and turned away. The feet were trimmed every 5-6 weeks with other horses. Quality of hooves improved with each appointment. Medio-lateral balance improved and the structure of the foot improved. Feet were in better condition than when they had been shod. No lameness.
13/6/14 - 1/10/14	No Lameness. In light ridden work. Shod in open heeled quarter clipped front shoes thinned on the lateral toe quarter of the left fore. Arch support in the form of equipak was applied to the left fore. It has become apparent that over the previous two shoeing's the feet have degenerated in the medial aspect the result being increased instability of the medio-lateral balance.
As of 5/10/14	Presenting with a significant medio-lateral imbalance leading to arch collapse in the medial seat of corn area, left fore more than right fore. Hoof wall quality was improved. Some improvement to the medial aspect of the foot due to equipak arch support. Shoeing plan: It was decided to change the shoe type to try and stabilise the landing and loading therefore equalising the forces placed on the hoof capsule. Therefore the foot was trimmed in a spiral as much as was achievable. Following trimming the limb was still considerably imbalanced medio-laterally therefore a medial spiral open heeled shoe was made from aluminium to try and rebalance the foot and subsequently limb. No arch support was put in at this time.
11/11/14	Horse still out of work apart from occasional hack. Some improvement to medio-lateral balance. There was a mark on the medial sole indicating were the sole had been collapsing onto the medial branch/heel of the shoe. But the medial heel looked stronger than previous and there was some concavity to the sole in the medial seat of corn area. Unusually the horse lost his right fore shoe. Shoeing plan: As previous, try to encourage medial heel growth and strengthening of the medial aspect of the foot. Trimmed in a spiral plane as much as achievable. Medial spiral lift open heeled shoe used. The right fore shoe rotated medially to support the medial heel from localising force from descending body weight due to lateral rotation of forelimb.
19/12/14	As previous re work. Continued improvement with medio-lateral balance leading to strengthening medial heel and quarter in particular the left fore but to some degree on the right fore. Again right fore shoe was lost. Right fore limb was re-evaluated. It was decided to ever so slightly rotate the shoe laterally due to the limb spiraling medially in the pastern. Shoeing plan: As previous medial spiral lift open heeled shoes.

Date of Shoeing	Comments
23/1/15	Continued improvement of medio-lateral balance, solar symmetry and strength of medial heels of both feet. Again right fore shoe was lost, shoe rotated laterally further to see if that would help. Potentially the shoe is helping make the limb become straighter therefore altering its action which may explain the loss of shoes in each of the last three shoeings. Shoeing plan: As previous medial spiral lift open heeled shoes.
27/2/15	Foot at its optimum, medio-lateral balance has stabilized as much as it can do, to continue with medial spiral lift shoes may become detrimental to the foot by creating a wedge under the medial heel. This would become negative because, the medial heel has developed and grown, therefore it no longer needs the elevation from the shoe to help it achieve level landing and loading. Shoeing plan: Trimming to the long axis. Half hear bar shoes can offer the foot increased weight bearing surface, engage the frog but allow the natural mobility of the hoof capsule to function as it would in an open heeled shoe. The half heart bar is placed on the medial aspect of the frog therefore increasing the bearing surface on the side that is overloaded due to conformational negatives.
30/3/15	Right fore shoe lost in last shoeing. Both feet continue to look stable with small changes that could be due to the environment. Shoeing plan: It was decided to continue with the half heart bar shoe on the left fore and use a toe clip open heeled shoe on the right fore.
8/5/15	Both feet have degenerated over the last shoeing cycle. Medio-lateral balance has become destabilized to some degree and the medial heel and quarters are losing strength and height. Shoeing plan: Both feet Trimmed to the long axis. Medial spiral lift aluminium open heeled shoes fitted to try and stabilize the medio-lateral balance.
12/6/15	During the last shoeing cycle the horse has moved yards and is now being worked every day primarily on a surface with hacking once a week. Aluminum shoes were deformed and completely worn out from the three weeks the horse has been there in work. Medio-laterally the foot has stayed unstable from last appointment. The medial heel has collapsed on the left fore particularly with the right fore following albeit to a lesser degree. Shoeing plan: Both feet trimmed to the long axis. It was decided to change the shoe type to full heart bar shoes without clips but a rolled toe was used. his allowed the breakover to be eased and the anterior/posterior balance to be controlled but without the use of clips on the quarters which may restrict the natural movement of the foot in expanding from the toe.

Date of Shoeing	Comments
15/7/15	Further degeneration of the medial heel and quarter especially on the left fore but also on the right fore. Clearly the heart bar was effective but only up to a certain point and the horse being in full work and competing at dressage required more support. Arch support was required. Shoeing plan: Both feet trimmed to the long axis. Same shoes as previous applied with equipak arch support in both feet.
20/8/15	Signs of recovery medio-laterally and in the medial heels of both front feet. Horse considerably smaller than he was regards weight which will have a positive impact on his feet. Left fore there is some growth of the medial heel and a reduction in how convex the sole is in the medial seat of corn area. Quality of hoof wall good. Shoeing plan: Both front feet trimmed to long axis. Aluminum heart bar shoes 1x3/8 to give more material for the foot sit on without the penalty of weight you would get using steel. Equipak arch support added.

Case Study 5

Horse Details	Comments
Age	12 years old
Height	16.1HH
Weight	523KG
Condition Score 0-5	2
Breed	Irish Sports Horse
Forelimb Conformation	Left Fore: Lateral rotation with laterally offset hoof capsule. Broken back hoof pastern axis Right Fore: Lateral rotation with laterally offset hoof capsule. Broken back hoof pastern axis
Laterally Offset Hoof Capsule Measurement	Left fore: Right fore: (See figure _ in appendix)
Type of Work	Eventer BE 100/Novice
Environment	Clay
Diet	Hard feed - top spec cool and condition/top spec balancer Hay - ad-lib Grass - turnout

Shoeing History

Date of Shoeing	Comments
2006	Bought - Sound
2010	First onset on forelimb lameness. Bruised heels to both front feet. Horse was referred to Equine hospital for remedial farriery.
2013	Hindlimb lameness undiagnosed Referred following right forelimb lameness. Presented with severe medio-lateral imbalance to both front feet especially right fore. Sole in the seat of corn extremely thin due to medial arch collapse and over trimming previously. Broken back hoof pastern axis (bbhpa). Shoeing plan consisted of addressing the medio-lateral balance as effectively as possible to the long axis. A heart bar shoe was used to allow extensive caudal support to address bbhpa and engage the frog to relieve the heels of excessive loading. The lateral toe quarter was thinned to allow for level landing.

Date of Shoeing	Comments
As of 29/10/14	Lame on right fore 3/10 no diagnosis. Hindlimb lameness diagnosed right hock injury Shoeing plan: Currently not working much so shod in open heeled quarter clipped front shoes.
7/11/14	Slight lameness following previous shoeing described by rider as a bit short. Lameness progression in left fore since 2/11/14 described by rider as 8/10. Box rested until today. No heat or increase in digital pulse looked to have improved. Shoeing plan: Horse shod in heart bar shoes with lateral toe quarter thinned to help horse land level.
4/12/14	Still unsound but described by rider as unlevel. Improved with heart bar shoes applied on 11/9/14. Both front feet continue to show considerable medio-lateral imbalance. Some thickening and strengthening of sole in medial seat of corn on right fore. Shoeing plan: Continued with steel heart bar shoes. Tried to float the medial heel and fill with equipak as an arch support. Difficult to achieve as frog is flat and level with trimmed lateral hoof wall therefore no leverage from the frog was gained leaving the littlest of gaps on medial aspect between shoe and foot. Need to make a heart bar shoe with a step in the section from the foot surface aspect therefore 'floating' the heel and allowing it to sit on a cushioned arch support.
8/1/15	As before horse still unlevel but able to do flat work on a surface. Hindlimb lameness still present and no Veterinary intervention to help or improve. Is impacting on forelimb. Shoeing plan: Trim both front feet to long axis as much as is achievable. Heart bar shoes made from aluminum 1x1/2 inch fitted. 1/2 inch used to allow me to put a step in the medial heel quarter and float the medial aspect of the right fore foot (described above) and 1 inch gives the horse more material to sit on without paying the penalty gained if using steel.
11/2/15	Horse continues to be unlevel but is being ridden a lot and competed at low level unaffiliated dressage competitions. Medio-lateral balance improved meaning less of an imbalance over the shoeing cycle. As a result the medial aspect on both front feet in particular the right fore improving and strengthening. Reduced shattering of the hoof wall in medial heel. Shoeing plan: As previous

Date of Shoeing	Comments
18/3/15	Horse continues to be unlevel but is being ridden a lot and competed at low level unaffiliated dressage competitions. Continued progress with the medio-lateral balance, meaning less of an imbalance over the shoeing cycle. As a result the medial aspect on both front feet in particular the right fore improving and strengthening. Reduced shattering of the hoof wall in medial heel. Shoeing plan: A medial spiral lift straight bar shoe was applied to the right fore and a heart bar to the left fore as previous. Due to my equipak gun breaking as i tried to use it on left fore both feet had to be left without equipak until a new gun was bought. Horse went quite lame without the arch support of equipak. Once the equipak was applied a week later soundness was improved. The medial spiral lift was used at this stage due the improved and healthy condition of the medial heel and quarter. Prior to this point a medial spiral lift would in this authors opinion been too much change medio-laterally and 3 dimensionally for this horse to cope with.
23/4/15	Horse continues to be unlevel but is being ridden a lot and competed at low level unaffiliated dressage competitions. Unlevelness blamed on hindlimb lameness by rider in the knowledge that the horse has not had hocks medicated in over a year. Medio-lateral balance continues to stabilise and improve meaning less of an imbalance over the shoeing cycle. As a result the medial aspect on both front feet in particular the right fore improving and strengthening. Greater concavity to sole in medial seat of corn area. Shoeing plan: As previous
28/5/15	Continued success with shoeing and medio-lateral foot balance. everything is stable at present. Horse continuing in work albeit low level and on a surface. Hindlimb still un-medicated. Shoeing plan: As previous
2/7/15	Front feet stable and medio-lateral imbalance continues to be reduced in severity. Continued in work and still hindlimb un-medicated. Shoeing plan: As previous
6/8/15	Front feet stable and medio-lateral imbalance continues to be reduced in severity. Continued in work and still hindlimb un-medicated. Shoeing plan: Horse appears to land level on right fore therefore a medial spiral lift may become a negative acting as a wedge and causing the heel to overloaded again. It was decided to go back to a heart bar shoe with equipak on the right fore and the left fore has continued in a heart bar shoe with equipak arch support.