

POST-MORTEM COMPUTED TOMOGRAPHIC ANGIOGRAPHY IN EQUINE DISTAL FORELIMBS

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Introduction

In-depth understanding of pathophysiological processes occurring in the vasculature is of great importance for improving diagnostic and therapeutic approaches to diseases. To gain further insight into the vasculature a model allowing high-resolution 3D-visualization is necessary.

Up to now post-mortem angiography of equine limbs was limited to limbs collected immediately after death, combined with prior preparation of the vasculature¹⁻³, which significantly limits the use of such a model.

In human forensic medicine, post-mortem angiography has been performed using oily contrast agents in frozen-thawed cadavers without prior preparation⁴⁻⁶. Lipophilic solutions have proven to be better suited in human post-mortem settings as they decrease extravasation and flush out blood clots^{5,8}.

This pilot study evaluated the feasibility of CT-angiography using 2 different contrast agents in frozen-thawed distal equine cadaver-limbs without prior tissue preparation.

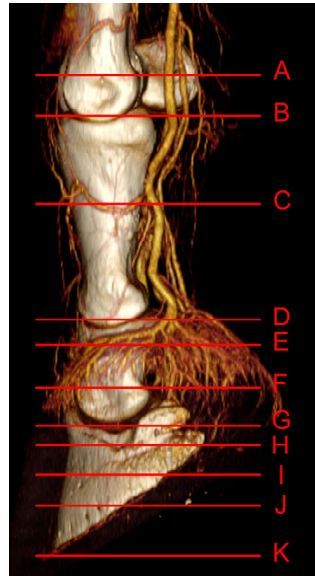


Figure 1 (above): 3D reconstructed post-mortem CT angiography of an equine distal forelimb after perfusion with lipophilic contrast material. The 11 evaluated levels are marked A-K in this reconstruction.

Materials and Methods

Two radiographically normal adult equine forelimbs, disarticulated at the carpus, were collected from an abattoir and frozen for approximately 2 weeks without prior preparation. After thawing, the limbs were cleaned, clipped and subsequently perfused through the median artery and radial vein using either diluted hydrosoluble (HS; Accupaque™, 37.5 mgI/mL) or lipophilic (LP; Angiofil®⁷, 6%) contrast medium.

Success of reperfusion, defined as visualization of vessels without extravasation or filling defects, was evaluated at 11 predetermined levels (A-K, Figure 1)⁹ at 114 vessel cross-sections on CT-studies (16 slice MDCT, 140 kV, 200 mA, 2 mm thickness, 1 mm increment, pitch 0.688¹⁰).

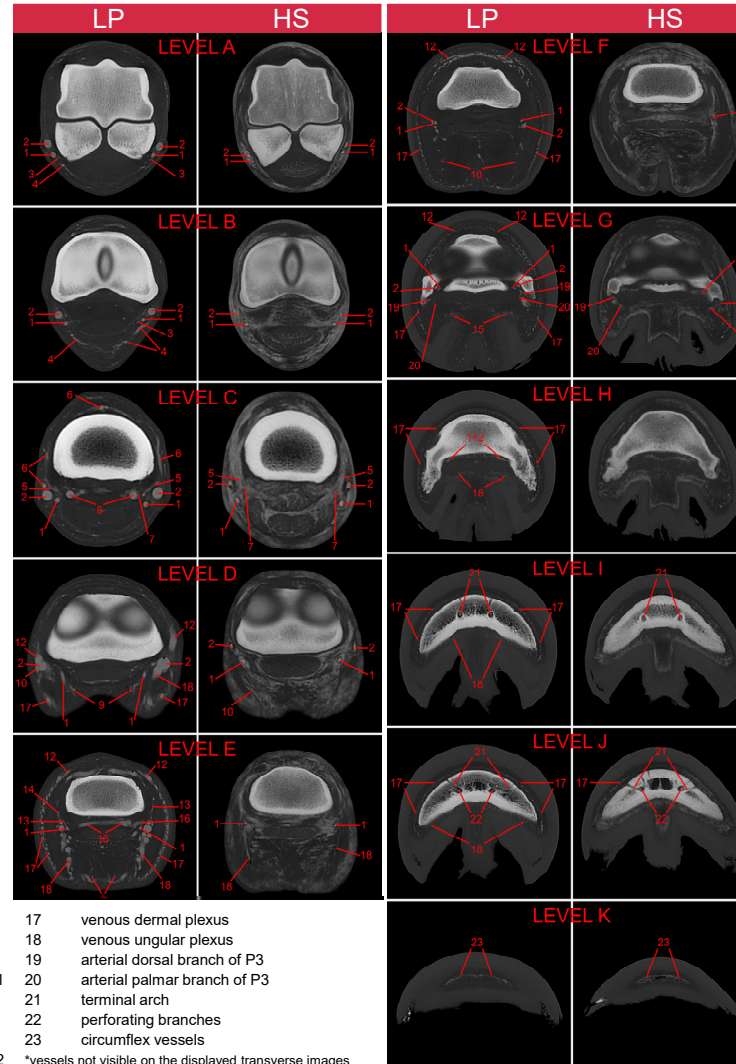


Figure 2 (right): Comparison of paired transverse images (levels A-K) of post-mortem CT angiography performed with either lipophilic (LP; left images) or hydrosoluble (HS; right images) contrast media. The following vessels were evaluated:

- | | | | |
|---------|---|----|------------------------------|
| 1, 2 | palmar digital arteries and veins | 17 | venous dermal plexus |
| 3, 4 | arterial and venous branch of the ergot | 18 | venous ungular plexus |
| 5, 6 | arterial and venous dorsal branch of P1 | 19 | arterial dorsal branch of P3 |
| 7, 8 | arterial and venous palmar branch of P1 | 20 | arterial palmar branch of P3 |
| 9, 10 | arterial and venous branch of the torus | 21 | terminal arch |
| 11*, 12 | arterial and venous coronary vessels | 22 | perforating branches |
| 13*, 14 | arterial and venous dorsal branch of P2 | 23 | circumflex vessels |
| 15, 16 | arterial and venous palmar branch of P2 | | |

*vessels not visible on the displayed transverse images

Results

The palmar digital arteries and veins as well as their major branches down to the perforating branches of the terminal arch were easily identified in both limbs and all levels (71.9% HS, 91.2% LP; Table 1). While filling defects were present in both limbs (52.4% HS, 19.2% LP; Table 1), extravasation was only observed in the HS contrast perfused limb (64.0% HS) and which considerably deteriorated the image quality upon subjective assessment (Figure 2).

level	expected vessels	Lipophilic Contrast		Hydrosoluble Contrast	
		visualization	filling defects	visualization	filling defects
A	4	4 (100.0%)	0 (0.0%)	4 (100.0%)	2 (50.0%)
B	8	8 (100.0%)	0 (0.0%)	4 (50.0%)	0 (0.0%)
C	12	11 (91.7%)	2 (18.2%)	11 (91.7%)	5 (45.5%)
D	16	13 (81.3%)	3 (23.1%)	15 (93.8%)	4 (26.7%)
E	22	21 (95.5%)	4 (19.0%)	13 (59.1%)	11 (84.6%)
F	12	11 (91.7%)	2 (18.2%)	10 (83.3%)	6 (60.0%)
G	14	13 (92.9%)	1 (7.7%)	9 (64.3%)	9 (100.0%)
H	12	11 (91.7%)	0 (0.0%)	6 (50.0%)	3 (50.0%)
I	6	4 (66.7%)	2 (50.0%)	3 (50.0%)	2 (66.7%)
J	6	6 (100.0%)	6 (100.0%)	5 (83.3%)	1 (20.0%)
K	2	2 (100.0%)	0 (0.0%)	2 (100.0%)	0 (0.0%)
total	114	104 (91.2%)	20 (19.2%)	82 (71.9%)	43 (52.4%)

Table 1: Comparison of visualization (visible vessels divided by expected vessels) and filling defects (vessels with filling defects divided by visible vessels) in two forelimbs that underwent post-mortem angiography with either hydrosoluble or lipophilic contrast medium in 11 levels (A-K).

Conclusion

Reperfusion of frozen-thawed equine distal limbs with the lipophilic contrast agent Angiofil® allows for high-quality 3D-visualization of the vasculature in post-mortem CT-imaging, while hydrosoluble contrast media are not suited for this purpose.

References

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