VASCULAR MORPHOLOGY OF THE MOUSE MOLAR PERIODONTIUM

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A research report submitted in partial fulfilment
for the degree of Master of Dental Surgery.

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SUMMARY

A study of the vascular networks around the palate and the molar socket of the male laboratory mouse was conducted using a perfusion technique for methyl methacrylate casting followed by coating of the vascular replica with gold. Examination and photography of the bulk specimens was carried out under the scanning electron microscope. Stereopair photographs of the areas of interest were examined under a viewer for three-dimensional imaging.

The findings indicated that the vascular network followed closely the configuration of the soft tissues. The palate showed areas of thickening of the vascular network which resembled the thickening of the rugae. Wavy, capillary-like vessels were found at the apex and the side slopes of the rugae. In the inter-rugal valley large venous-like vessels were the predominant feature. It can be hypothesized that the wavy pattern of the rugal capillaries plays an important role in permitting their elongation during masticatory shearing deformation of the gingivae. By contrast, the large venous-like vessels in the inter-rugal valley may absorb most of the compressive loads during function.

The gingival vessels encircling the neck of the molars consisted of two major systems. An outer circular vessel system located occlusally and connected to the mucosal vessels. The inner circular vessel group was situated adjacent to the gingival crevice and joined the axially aligned periodontal ligament vessels. The outer and inner systems were linked by anastomoses orientated in a radial direction. These patterns of the gingival vessels have not been previously described.

There were glomerular-like vascular formations radiating

towards the gingival crevice from the inner circular vessel system. These glomerular-like structures consisted of two short, fine stalks uniting to form globe-like endings. One of these fine stalks came from a terminal arterial vessel, while the other fine stalk attached to the single, venous circular vessel of the inner system. The junction of these fine stalks was enlarged and twisted. It is suggested that these glomerular-like structures may give rise to interstitial crevicular fluid and thus provide a self-cleansing function to the gingival crevice.

Large venous-like periodontal ligament vessels were demonstrated alongside the coronal third of the molar socket. These ligament vessels proper were connected to the inner circular vessel system by short axially aligned connecting vessels of the same size. The major periodontal ligament vessels were orientated in a palisade manner as they extended towards the apex where they joined to form a hammock-like cushion arrangement. There were three patterns of anastomoses between the palisading ligament vessels. They exhibited a polygonal intertwining arrangement in the occlusal third, a longitudinal loop-like orientation in the middle third and a circular hammock-like cushion at the apical region. Huge reservoir-like venous cushions were a characteristic feature of the interradicular furcations.

The medullary vessels linked the periodontal ligament vessels and gingival vessels at various levels. These medullary vessels formed a network intraosseously and eventually drained via large venous collecting vessels located in the bone opposite the level of the molar apices.

No information has been previously documented on mouse periodontal vascular casts. Some of the findings resulting from this investigation have not been reported in other species. This study

extends our knowledge of the periodontal microvascular bed and emphasizes data which differ from other studies in the literature.

SIGNED STATEMENT

This project is submitted in partial fulfilment of the requirements for the Degree of Master of Dental Surgery at The University of Adelaide.

This report contains no material which has been accepted for the award of any other degree or diploma in any University. To the best of my knowledge and belief, it contains no material previously published or written by another person except where due reference is made in the text of the report.

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LIST OF ILLUSTRATIONS