

Surgical methods in mouse tooth autotransplantation research

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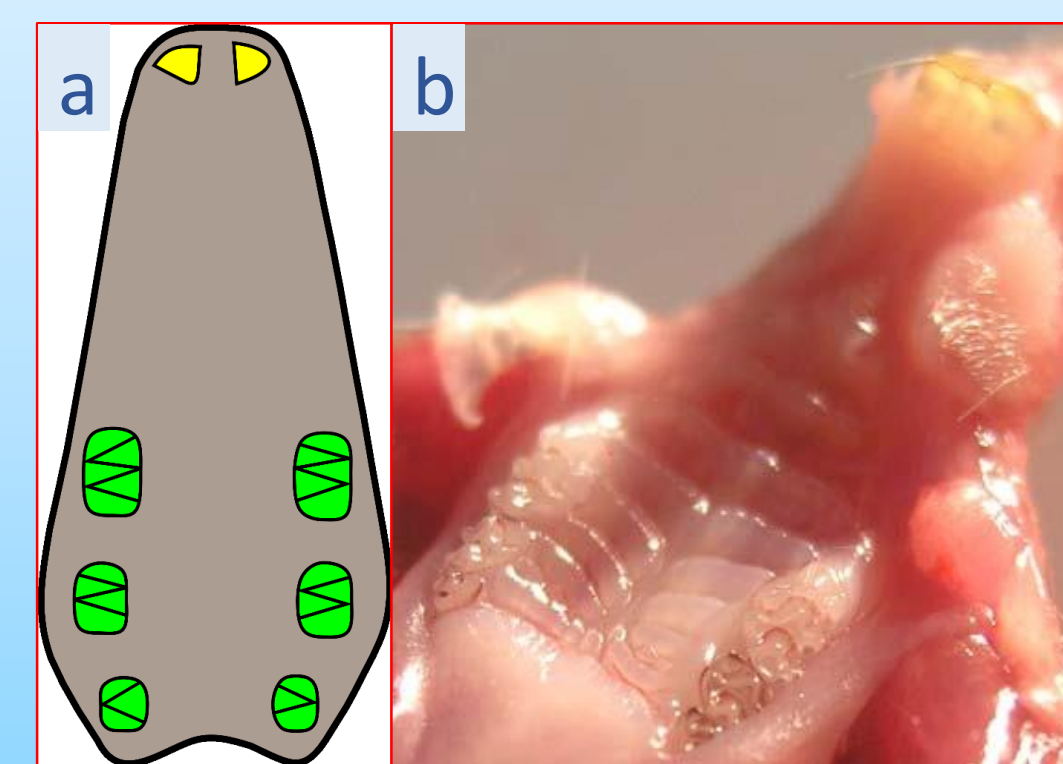
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Introduction

Autotransplantation of teeth is one of the possibilities to substitute the missing teeth in the dental arch. In comparison to prosthetic dentistry and implantology, autogenous transplantation is the most natural way of tooth replacement, it has a firm place in the field of dentistry because of preserving the physiological properties of teeth, periodontal and alveolar bone. The most common laboratory animals used in autotransplantation research are mice and rats.

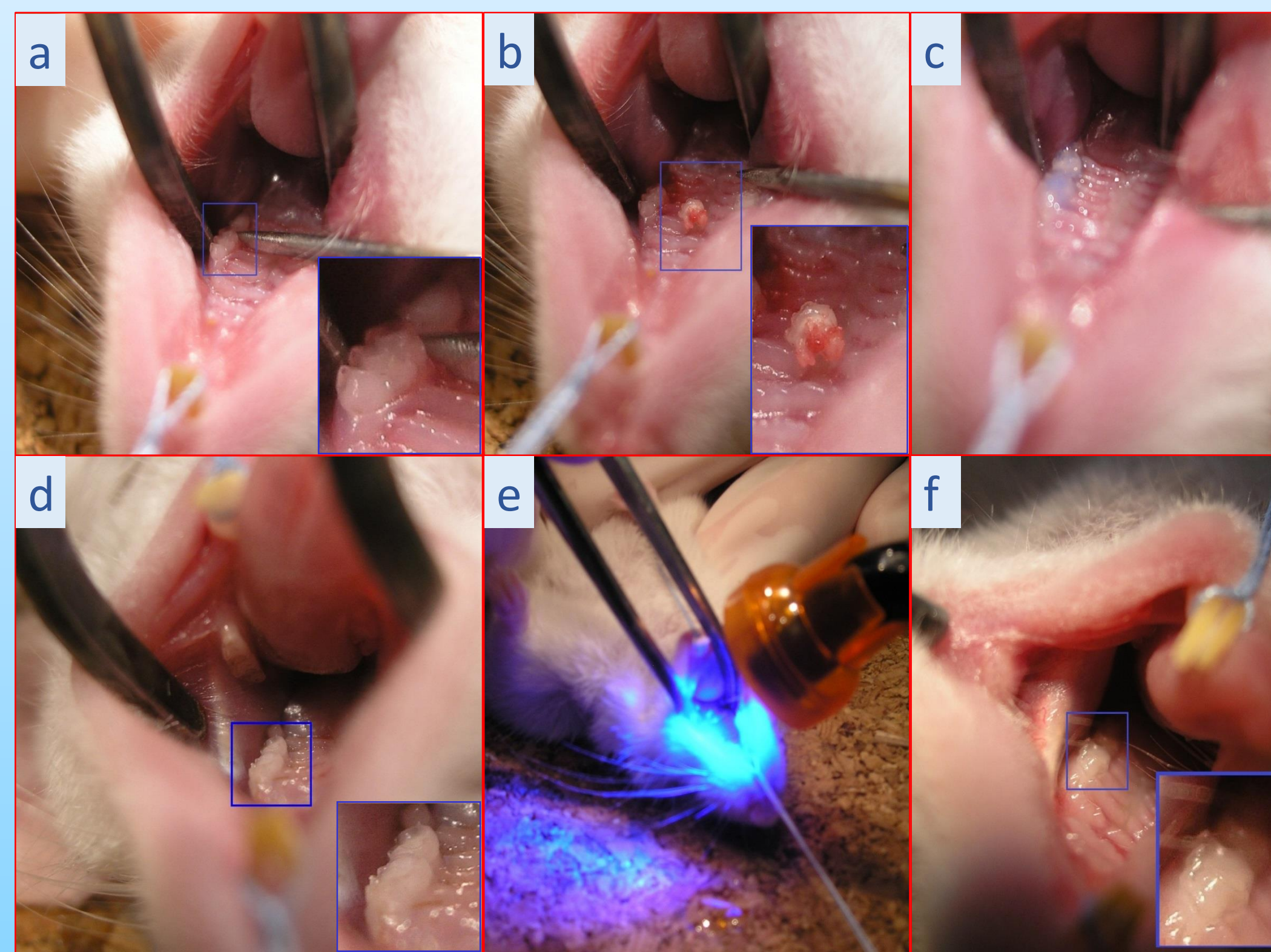


Upper jaw of a mouse

- a) Scheme of a mouse palate – one incisor, three molars and toothless diastema on each side
- b) Palatal view on the upper jaw in mouse

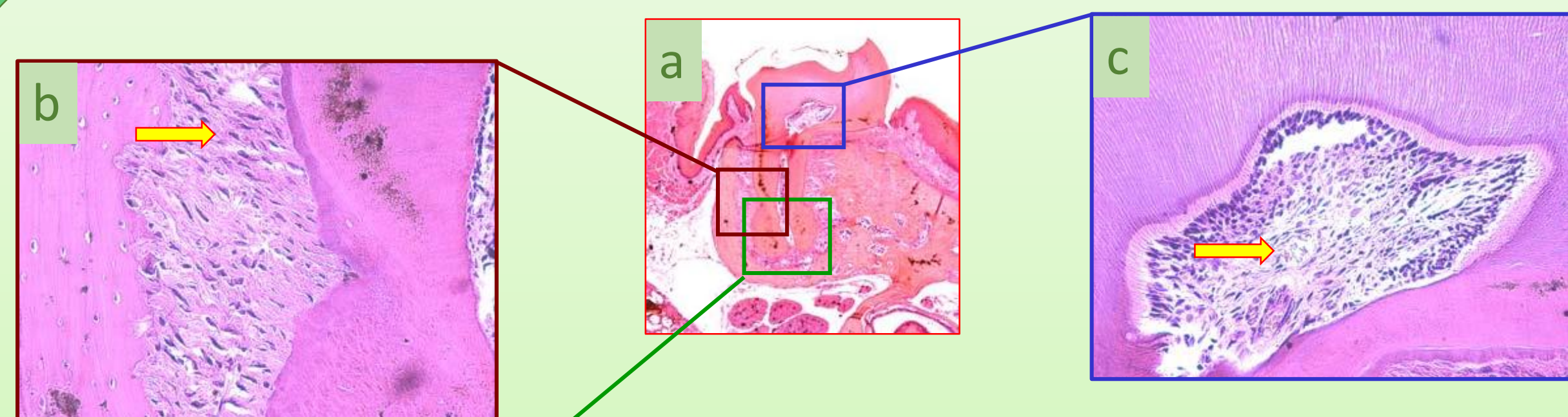
Materials and Methods

The experiment included 51 animals (laboratory mouse - line ICR). The second left upper molar (M2) was extracted following intraperitoneal anaesthesia. The tooth was extracted with minimal traumatization of periodontal ligaments and stored in saline solution at 37°C for 30 minutes before its transplantation into its original position in the dental arch. The tooth was etched by 37% phosphoric acid, washed in water, dried in air flow and bonded by composite adhesive system. Later, the tooth was fixed by the light curing composite resin splint. The histological sections were prepared from animals collected one or four weeks after surgery and slides were stained with hematoxylin and eosin



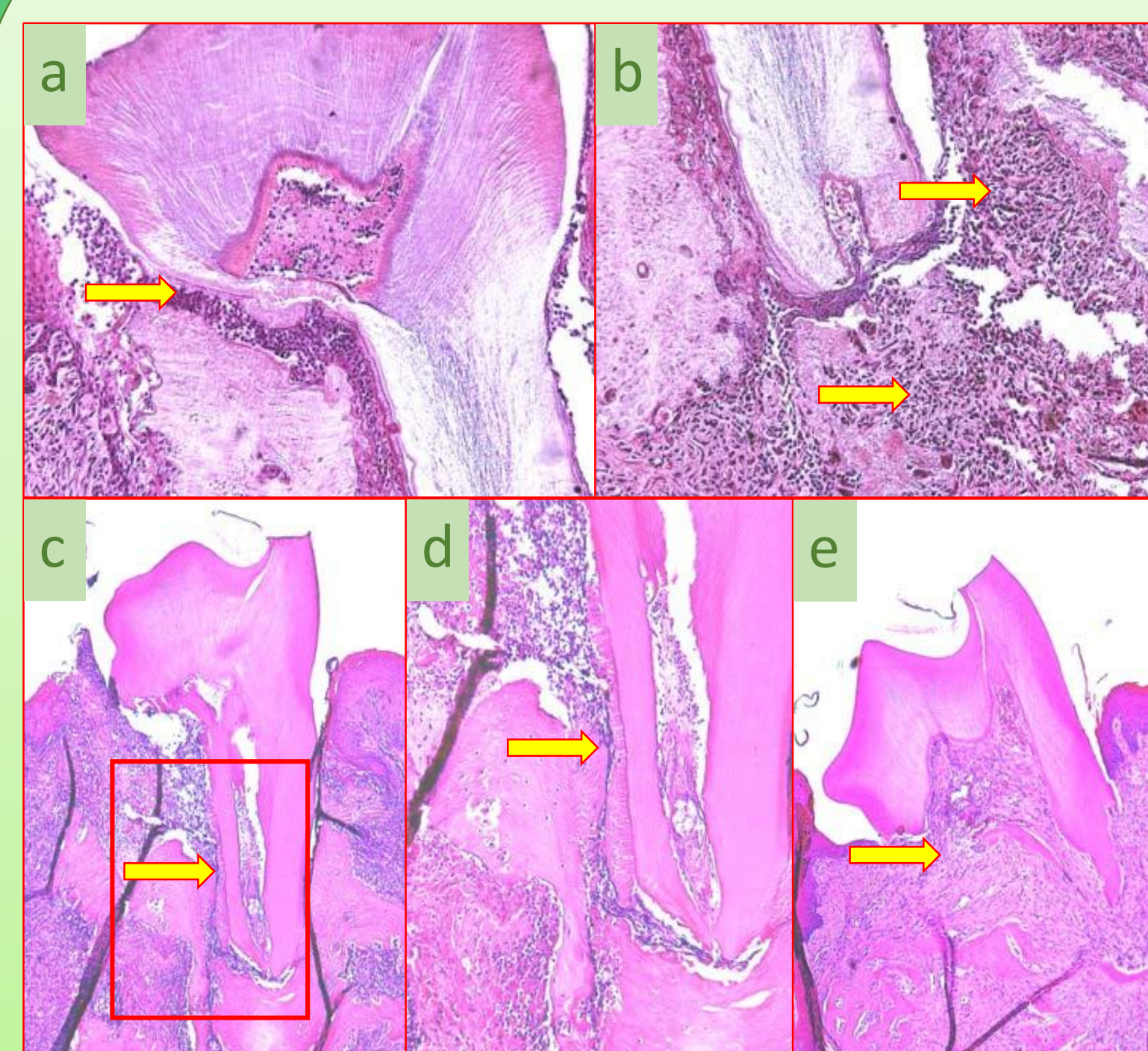
Tooth autotransplantation

- a) Tooth extraction – extraction instrument in the interdental space between M1 and M2
- b) Tooth M2 on the palate after extraction, periodontal ligaments are preserved on roots
- c) Etching by 37% phosphoric acid
- d) Chalky stained teeth after washing in water and drying
- e) Polymerisation of bonding system by light
- f) Composite resin splint on upper molars



Successfully autotransplanted tooth M2 4 weeks after autotransplantation

- a) Overview of transversal section at M2 level with the tooth attached to the alveolar bone
- b) Detailed view of parallel periodontal ligaments connecting alveolar bone and a root surface
- c) Coronal pulp with vessels containing erythrocytes
- d) Tooth apex widely open to a periodontal space



Complications of autotransplantations

- a) Inflammation liquid infiltrated in the periodontal space (4 weeks after autotransplantation)
- b) Inflammation liquid infiltrated to the bone and paramaxillary space (4 weeks after autotransplantation)
- c) Ankylosis (1 week after autotransplantation)
- d) Detail of the tooth with ankylosis
- e) Root resorption (4 weeks after autotransplantation)

Conclusions

To understand regenerative processes after autotransplantations, severe animals models and histological/molecular methods have been previously established. We revealed several advantages and disadvantages of using mouse as a model species for this technique. This laboratory animal offers a short gestation period, numerous offspring, low housing costs and easy handling. Despite the monophodont dentition and reduced dental formula (1003/1003) together with hypsodont incisors, toothless diastema and enamel free areas on molar surfaces, numerous findings can be successfully extrapolated from rodents to humans. Periodontal healing and pulp revascularisation can be recognised 4 weeks after surgery in case of successful autotransplantation in mice. Although advantages of this surgical method are prevailing, there are some complications, which have to be solved. Ankylosis and inflammation were noticeable on histological sections prepared one week after surgery. Signs of inflammation increased in samples collected 4 weeks after autotransplantation. Our future aims are to use also immunohistochemical and molecular methods to explore the healing process of the tooth attachment.

Acknowledgements

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