Chapter

2

Animal Models and Experimental Studies

Requirements of Animal Model

The author used two animals in his research on the TMJ and both animals are safe and may be friendly and vegetarian and they are Mecaca Iris Monkeys and Rabbits.

There are certain requirements for choosing the animal as animal model; the animal should be chosen which allow giving close comparative studies to human tissue reaction.

In order to get the following points from our experiments, we have to know and understand:

1. An information about the clinical difficulties we might face during the technique been used in the experiment.
2. The effect of the technique been chosen on the masticatory requirement of the animal.
3. Radiographic record of the experiment and radiographic changes that occurred post experiment.
4. Histological studies of the tissue reaction at the end of the experiment.

Further requirement of the animal model to have:

1. Tissue reaction similar to that of man.
2. The diet and masticatory pattern similar to man.
3. The ability to allow repeated examination and if necessary with the aid of sedation animal workers.
4. Bacterial flora similar to that of man.
5. The animal should not carry any disease that may be transmitted to man.
6. The cage of the animal required hygienic environment.
7. The researcher should be prepared to be sterile with gown, masked, head cap and cloves.
8. Special sterile Shoes wear during working in the animal lab and all

cloths replaced by special gowns, shoes should be immersed in a concavity depresion contain sterilizing fluid during movements inside the animal lab to keep the ways sterile.

Historic paint of examiners of the Royal College of Surgeons of England showing Examination committee examining a Fellow of the college, we passed this stage and learned from this college our surgical education and our ability in research and the place we did our research.

Anatomy of TMJ of Mecaca Iris Monkey

In the last forty years TMJ research on animal models increased and the genetic revolution has not revolutionized TMJ research for our research the most popular one was the monkey these animals chosen due to changes of research question. The relative proximity of the monkey and human lineage is no guarantee of similarities in TMJ function but it's the only animal can be chosen for our experiment for total replacement of the TMJ by prosthesis.

TMJ is an area remain a problem in function and impossibility because the human TMJ is unique in several features such as the comparatively enormous lateral pterygoid muscle, but help researchers to have a good understanding of how the TMJ function in their animal model.

In general the gross anatomy of TMJ of Mecaca Iris Monkey is very similar to that of man but the main differences are that the condylar neck of the monkey comparatively shorter and the post glenoid tubercle is relatively larger and the glenoid fossa is more shallow and the articular eminence less prominent.

These differences does not effect on the viability of the experiment, the dental formation of teeth except the canine closely appearance to human.

Disadvantages of monkeys, the price of the animal rather high and the institute of research to overcome this problems they do establish a breeding colonies, and the price of Rabbits much less. Monkey's requirements to keep up very expensive including heating, lighting, cleaning materials and feeding of monkey required food stuff highly trained. The true difficulties arise largely as result of most useful features of simian primate, their similarities to man and because of this they are not only liable to human diseases but themselves carry infection which can be transmitted to man, the animals were kept in a separate cages of aluminum alloy in a Temp of 80 F and controlled humidity and because monkeys are agile active animals they need to smear their cages with remnant of their food and regular cage washing as essential duty.

Their similarities to man they are suitable to human disease and also may carry infection which can be transmitted to man, the animals cages required a high standard of hygienic environment. Monkeys are more liable to be effected by TB and respiratory infection.

In the colony of monkeys a Vattern surgeon required to look and to check proper care they got and also to control the breading of monkeys.

Some of these monkeys may carry and transmitted to researchers and workers enteric infection and viruses. Monkey animal model was an excellent model for total replacement of the TMJ by two part prosthesis and that work was a pioneer work.

TMJ of monkey and lateral view of mandible of the monkey.

The Rabbits TMJ Specifications

Rabbit TMJ attract our research as introduced as model for TMJ disease arthroscopy, disc displacement and a good model for reconstructive procedures like lateral cervical flap, TMJ temporal fascia flap for reconstruction of the capsule and for total replacement of the TMJ in many diseases by using chondro-ossous graft from iliac crest. This based on biological level and the response of mesenchyme cells to a certain type of loading, it has demonstrated that TMJ cells are physiologically are different from other joint cells, these species has emerged as preferred TMJ model for practical and clinical reasons not because their TMJ are particularly similar to those of humans.

Rabbit have converged with the ruminants in terms of occlussal pattern and masticatory movements, but the condyle is rounded and the symphysis is immobile but UN fused. Rabbit TMJ have a pronounced anterior-posterior component which is utilized in certain masticatory movements, the masticatory function in rabbits and the load carried during masticatory process based on muscle activity, the working side condyle may be completely unloaded during the power stroke of chewing in rabbits.

Rabbit TMJ less complicated than Monkey TMJ and the condyle smaller and thin, with short neck of the condyle, there is no glenoid fossa but a slit of 3mm+- between the junction of zygomatic root of temporal

bone and temporal bone, the condyle articulate with the slit in the base of skull with the zygomatic root of temporal bone, the shape of the condyle rather thin, the superior surface of rabbit condyle, anteriorly thicker and about 4mm+- and postriorly 2mm+-, the length of the condyle about 10mm+- and neck length about 7mm+-, the anterior part of the condyle articulate with the zygomatic root of temporal bone with no glenoid fossa, the joint was covered by thin capsule, interiorly on the condyle there is a small depression may represent as condyle fossa for attachment of lateral pterygoid muscle. The articulation of the joint limits the function by hinge movement (opening closing) and protrusive retrusive movements.

The advantage of the Rabbit as animal model, its cost cheaper than monkey, healthy animal and friendly, vegetarian and cleaner, we can keep few rabbits in one cage while every monkeys require it is on cage, the experimental studies on Rabbits, cannot be used for total replacement of the TMJ by two part prosthesis because there is no glenoid fossa and the condyle rather thin and the functional movement only limited by hinge movements, but Rabbit condyle was an excellent animal models for experimental studies for using the temporal fascia flap for reconstruction the capsule of the joint and to study cytological changes of the head of condyle after reconstruction of the capsule by temporal fascia flap. The rabbit also been used as experimental model by the author for reconstruction of the condyle by chondro-ossous graft for studding the cytological changes of the graft after transferring the graft from iliac crest as weight bearing to the TMJ for masticatory function, also been used to study the condyle as growth center after excision of the condyle of newly borne rabbit, we observed severe deformity of the lower jaw on the side where the condyle been resected, that procedure proved the condyle is a growth center.

Lateral view of Rabbit Skull.

Lateral view of Rabbit mandible

References

[1] Herning S W. TMJ anatomy and animal model. J Muscculoskeskelet Interact, 2010, 3; 4: 1/6-5/6.