Animal models for spinal research

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Basic research and preclinical testing of new surgical methods often involve animal experiments. In spinal research in particular, this can cause a dilemma because most tests cannot be carried out on humans but animal models may not be appropriate. Differences in anatomy between the various species and in loading of the spine between bipeds and quadrupeds can lead to differences in biomechanical properties. There are also known differences between species in spinal biology, e.g. cell populations and tissue composition. Moreover, human spines of interest are mature or even elderly; animal models are usually immature. These differences can all influence outcomes when using animal models.

When comparing animal species and humans, there may be similarities in some parameters but differences in others. The cervical spine of a sheep, for example, has a similar range of motion to that seen in humans; however, this does not justify its use for studying the subsidence tendency of cages in the cervical spine because the vertebral bone density in a sheep is about fourfold greater than that of a young human. As another example, the tail of an animal has been suggested as an attractive model for studying disc

degeneration, with minimal invasion and damage to the animals. Although the bovine tail disc has been described as having many features which are similar to those of humans, one has to question the use of mice or rat tail discs because of the persistent notochordal cells which most likely react differently to mechanical loading or other interventions.

Before using animal models it is therefore our duty to study how the parameters of interest differ between species in order to be aware of the limitations of any particular animal model and to ensure conclusions reached are applicable to man. If we want to justify the use of animals in spinal research it is our responsibility not to waste research capacity, manpower and finance and most importantly, not to sacrifice animals in vain.

In this issue of the European Spine Journal you will find a comprehensive review article, which discusses the factors, which should be considered when using animal models for studying disc disorders or degeneration. I hope this paper will provide a path for avoiding meaningless animal experiments from now onwards.

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