

# Experimental osteoporosis- different methods of ovariectomy in female white rats

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## Abstract

Rats are currently principal laboratory animals, used to investigate osteoporosis. The aim of the study was to present and compare two operative methods of inducing osteoporosis in rats. **Materials and Methods:** Ten 3 months old female Wistar rats were divided into two groups with five animals in each group. In the first group, ovariectomy was preceded by a mid-line dorsal skin incision, 3cm long. After removing the ovary, the previous incision of the muscle required suturing. In the second group, ovariectomy was performed by two dorso-lateral incisions, approximately 1 cm long above the ovaries. With the use of a sharp dissecting scissors, the skin was cut almost together with the dorsal muscles and the peritoneal cavity was accessed. There was no need of muscle suturing. **Conclusion:** The operation, performed in the second group, was technically easier, less time consuming and less harmful for the used female white rats.

**Key words:** model of osteoporosis, ovariectomy, female rats.

## Introduction

Osteoporosis is a chronic, systemic, metabolic disease of the skeleton, characterised by reduced bone mass, architectural defects and lowered mechanical resistance to injuries, what eventually leads to higher risks of fractures. It is one of the most

frequent diseases of the mankind that occurs in every tenth person in the whole world and in every third woman after the fifteenth year of life. In Poland, about 9 million persons are at risk of osteoporosis.

Experimental animal models play an important role in improving the knowledge of the aetiology, pathophysiology, and diagnosis, as well as on preventive and therapeutical techniques, regarding osteoporosis. Rats are currently principal laboratory animals, used to investigate this disease, since they are inexpensive to maintain, grow rapidly, have a relatively short lifespan and are widely available [1, 2]. There are also various methods of obtaining a standardised pattern of osteoporosis, such as, for example, low calcium diet, LHRH agonists or ovariectomy [2, 3]. The latter one is considered to be the procedure that gives reliable model of osteoporosis [4, 5]. Ovariectomy itself can be performed in some different ways. The choice of operative method is very important, particularly, when it is necessary to operate of a few dozen animals in a short time.

The aim of the study was to present and compare two operative methods, regarding the duration of procedure, the degree of difficulty of operative technique and access to gonads.

## Materials and Methods

Ten 3- month old female Wistar rats weighing approximately 180 g were divided into two groups per five rats. In both groups operation was made after placing an animal on its ventral surface. In the first group, ovariectomy was preceded by a midline dorsal skin incision, 3 cm long, approximately half way between the middle of the back and the base of the tail (Fig. 1). Incisions of the muscles were made bilaterally. After peritoneal cavity was accessed, the ovary was found, surrounded by a variable amount of fat. Ligation of the blood vessels was necessary. The connection between the Fallopian tube and the uterine horn was cut and the ovary moved out. Because of muscle bleeding, its incision required suturing. Three single catgut stitches were

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Table 1.

Investigated group of rats	The manner of incision	The mean time from the incision of the muscle to the ovary removal (minutes)	Muscle suturing
The first group n=5	Single midline dorsal 3cm long	4,7	Yes
The second group n=5	Two dorso-lateral 1cm long	1,6	No

Figure 1. Longitudinal, dorsal midline skin incision.



Figure 2. Three single catgut stitches on the skin wound.



Figure 3. Two dorso-lateral incisions of the skin and muscles.



Figure 4. One single catgut suture on the skin wound.



placed on the skin (Fig. 2). In the second group, ovariectomy was made by two dorso-lateral incisions, approximately 1 cm long above the ovaries (Fig. 3). With the use of a sharp dissecting scissors, the skin was cut almost together with the dorsal muscles and the peritoneal cavity was thus accessed. The further part of the operation was parallel to the one in the first group. The muscle incision required no suturing. Skin wounds were closed bilaterally with one single catgut suture (Fig. 4).

The obtained results are presented in Table 1. In the first group, the mean time from incision of the muscle to the ovary removal was 4.7 minutes, whereas in the second group, it was 1.7 minutes only. That fact signifies the importance of precise muscle incision, what results in a quick location of the ovary. Otherwise, wrongly configured and inordinately large muscle incision leads to bleeding and demands stitching.

## Conclusion

Comparing the two presented methods of ovariectomy, we affirm that the operation, as conducted in the second group, was technically easier, less time consuming and less harmful for the female white rats.

## References

- Giardino R, Fini M, Giaversi G, Mongiorgi R, Gnudi S, Zati A. Experimental surgical model in osteoporosis study. *Bollettino della Societa Italiana di Biologia Sperimentale*. 1993; 69(7-8): 453-60
- Turner RT, Maran A, LotinunS, Hefferan T, Evans GL, Zhang M, Sibonga JD. Animal models for osteoporosis. *Reviews in Endocrine and Metabolic Disorders*, 2001; 2: 117-27.

3. Geddes AD. Animal models of bone disease. In: Principals of Bone Biology. Bilezikians JP, Raisz LG, Rodan GA, editors. San Diego: Academic Press; 1996, p.1343-54.
4. Yamazaki I, Yamaguchi H. Characteristics of an ovariectomized osteopenic rat model. Journal of Bone Mineral Research, 1989; 13-22.
5. Gurkan L, Ekeland A, Gautvik KM, Langeland N, Ronningen H, Solheim LF. Bone changes after castration in rats. A model for osteoporosis. Acta Orthopædica Scandinavia, 1986; 57 (1): 67-70.