



Hernia of the umbilicus and the *linea alba* in rabbits

Michel Gruaz, Esther van Praag

Little information is available about hernias of the abdominal wall in rabbits. The partial passage of the intestine or stomach through such an orifice is usually benign, but it can cause an intestinal blockage and lead to painful sequelae.

During gestation, the umbilical cord connects the ventral wall of the fetus' abdomen to the maternal placenta. Blood

vessels inside the cord allow it to be fed, to provide oxygen that is essential for its survival and to evacuate waste that it has



Figure 1: 25 days old rabbit fetus partially surrounded by fetal membranes and attached to the placenta via a relatively short umbilical cord (2 cm). Photo : Michel Gruaz

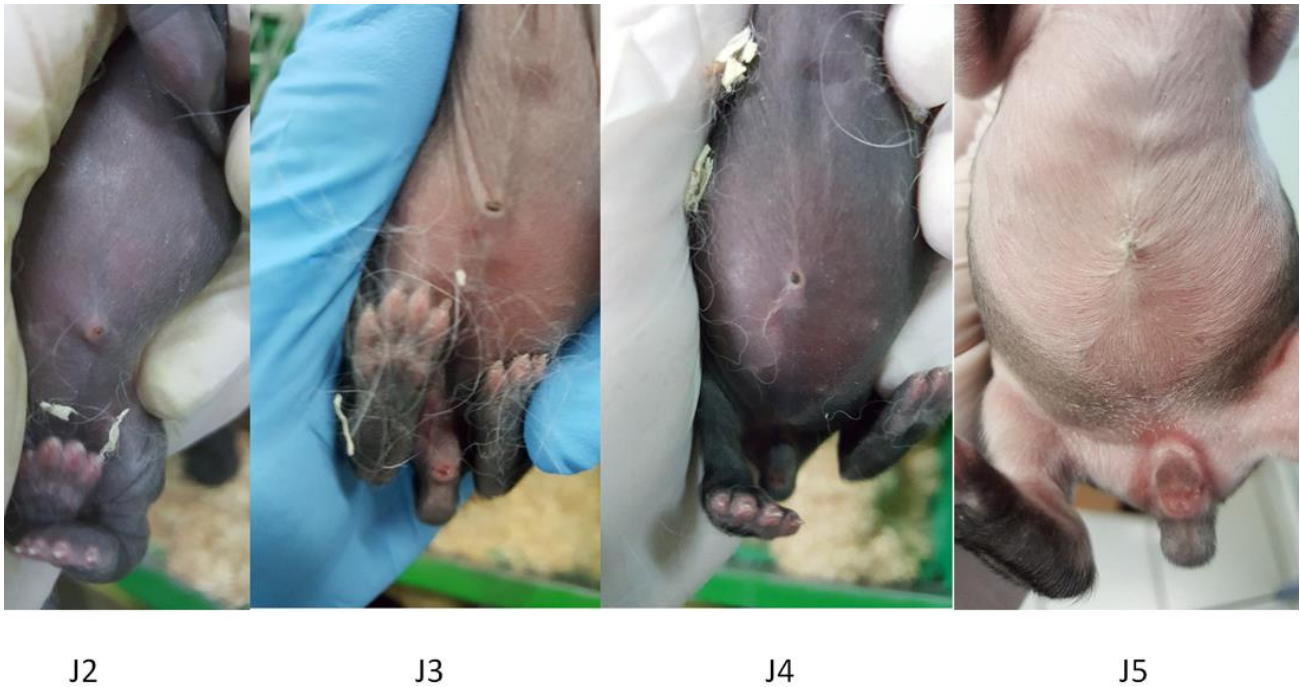


Figure 2: Visual follow-up of the umbilical cicatrization in rabbit newborn aged 2, 3, 4 and 5 days. Photo: Boucher et al., 2017.

produced. The fetus may have separated from the placenta and other membranes just before the birth. Others are born with their umbilical cord still attached to this organ (Figure 1). The doe will then section the cord with her incisors and lick the newborn to dry it. This action helps remove debris from the placenta, blood and stimulates blood circulation in the newborn. Once kindling is over, the doe eats placentas and stillbirths in order to eliminate any odor attracting predators in wild nature and to prevent bacterial growth. This behavior increases the rate of survival of the other newborn.

The fibrous scar resulting from the section of the cord is called umbilicus or navel. The remaining part of the umbilical cord necroses and falls off during the 4th day. Healing is spontaneous, but complete closure of the opening is complete only between the 4th and 6th day of life of the newborn rabbit (Figure 2).

The umbilical scar is a fragile area compared to the rest of the abdominal wall. It consists of the umbilical ring and scar tissue that gradually fills the opening. Complications are rare but possible (Figure 3). They include incomplete closure, delayed necrosis of the umbilical cord, disorders of vascularization or infection.

Inflammation of the umbilical opening

As long as the umbilicus is not healed, it is a gateway for germs present in the nest or brought by the hands of the person examining the newborns. There is, therefore, a risk of infection by bacteria and delayed healing of the umbilicus, even if the mother-rabbit licks her kits and eliminates their droppings from the nest. The most common bacteria are staphylococci, enterococci or Gram-negative bacilli such as *Klebsiella* sp. or *Escherichia coli*. The navel area becomes swollen, reddish and painful. In severe cases, an abscess of the navel

develops and is accompanied by a discharge of pus. Bacteria can invade the abdominal cavity and cause damage to the liver and the bladder, invade the blood circulation and cause sepsis. If the infection is not treated, healing is delayed, resulting in a partial closure. Over time, an umbilical hernia can develop.

Disinfection of the umbilical region during the first 2 to 3 days of life is controversial. Most breeders of show rabbits refrain from doing so. Effective natural products exist, such as tincture of horse chestnut, alfalfa, or lavender or thyme essential oils. For this purpose, there is also a natural commercial solution safe for use in rabbits (Cothivet,

Vetoquinol). These solutions are applied twice a day during the first days. They are gently applied to the skin with, e.g., a cotton swab soaked with the solution. Studies have shown that these natural products do not affect maternal behavior of the doe (abandoning the litter) and has no negative effect on the breastfeeding of her kits. The addition of drying talc in the nest reduces the moisture content and thus, reduces the bacterial population within the nest.

Umbilical hernias

A hernia consists of an orifice or a fissure through which an organ can protrude. There



Ombilic sain



Ombilic abîmé

Figure 3: Cicatrization of a healthy and an injured umbilicus in two 1 day old rabbits. Photo: Boucher et al., 2017.



Figure 4: Umbilical hernia in a young bearded rabbit.
Photo: Michel Gruaz.

are natural openings, such as the inguinal ring that allows the testicles to go down into the scrotal sac or back into the abdomen when the male rabbit is stressed. Other hernias have a traumatic, nutritional, mechanical or genetic cause. This is the case of umbilical hernias, which may have a congenital, hereditary, traumatic or acquired origin, appearing after a few days in the newborn or later in the life of the rabbit (Figure 4). A malformation of the umbilical ring during embryonal development, an

excessive umbilical opening, hereditary weakness of the abdominal wall, or weakening of muscles around the umbilical cord stump will prevent closure of the umbilicus. Newborns presenting a lack of closure of the umbilicus in the first days after birth are at risk to develop a congenital hernia. Males and females are concerned at equal frequency

An umbilical hernia may also be acquired following a trauma (Figure 3). A doe can mutilate her newborn by cutting the umbilical cord too close to its abdomen, or lick it with too much enthusiasm. It may also happen that the doe cuts the umbilical cord too close to the abdominal wall, when the cord is pulled forward during an inappropriate maneuver.

Any damage to the umbilical ring is irreversible and leads to incomplete healing of the umbilicus that may progress into an umbilical hernia.

Hernia of the *linea alba*

To our knowledge, no natural case of "white line hernia" has been described in rabbits. The white line (*linea alba*) is the center line of the ventral abdomen (Figure 5). It is made of fibrous tissue that extends from the sternum to the lower belly. Any malformation of the white line during embryonal development or any weakness can cause a tearing of the abdominal wall muscles and herniation (Figure 6). Another favoring factor is an increase in pressure inside the abdomen due to intestinal stasis or pregnancy. The white line hernia is often

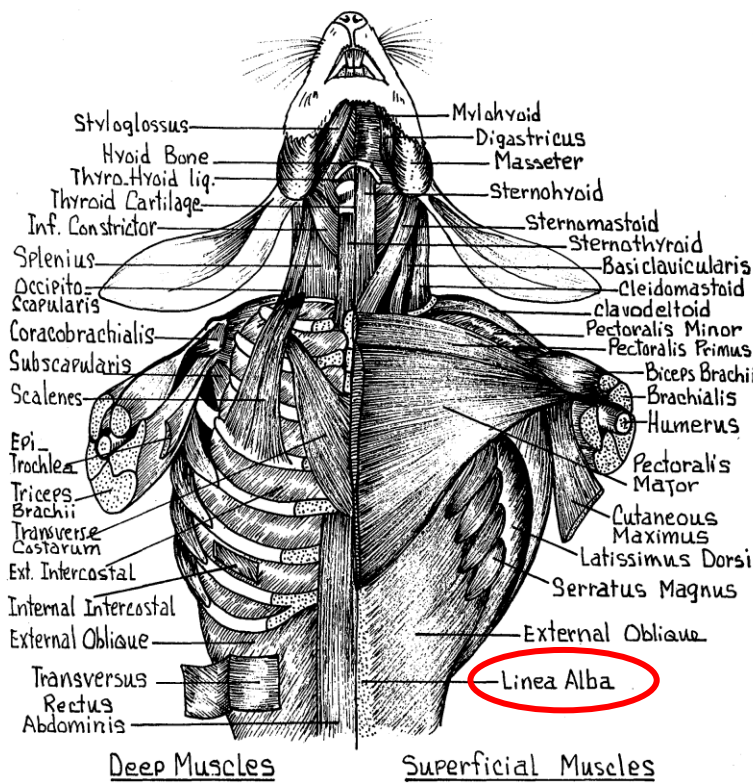


Figure 5: Ligne blanche (*Linea alba*) chez le lapin et muscles s'y rattachant. Illustration: Edwin Chen, 1957

outside, the hernia forms a more or less extensive lump, depending on the size of the opening in the abdominal wall and the intestinal mass within it. Their usual evolution is an increase in volume. They contain mainly intra-abdominal fat when small. When their size increases, the risk of protrusion of the intestine or stomach is increased. When digestive organs pass through the opening and come in contact with the skin, visceral adhesions may form (Figure 8). These are fibrous bands that bind the intestine, stomach, liver to the wall of the abdomen. Over time, these adhesions become a source of discomfort, pain and problems as they interfere with digestion. Although hernias do not generally present a danger to the health of the rabbit, they can lead to critical

located in the stomachal part of the abdomen (epigastric hernia) or above the navel (Figures 6, 7). The latter is sometimes associated with an umbilical hernia. Protrusion of an organ of the digestive system such as the stomach or intestine can lead to a critical and very painful situation for the animal.

situations in case of bowel obstruction.

Protrusion of a digestive organ

A hernia of the umbilicus or white line will not heal by itself. On the contrary; there is a risk of intermittent or permanent eversion of the intestine or stomach through the abdominal wall, forming a pocket-like structure. Seen from the



Figure 6: Epigastric hernia in a young bearded rabbit. Photo: Michel Gruaz.



Figure 7: Epigastric hernia in a young bearded rabbit with a thick edge (ring) of scar tissue. Photo: Michel Gruaz.

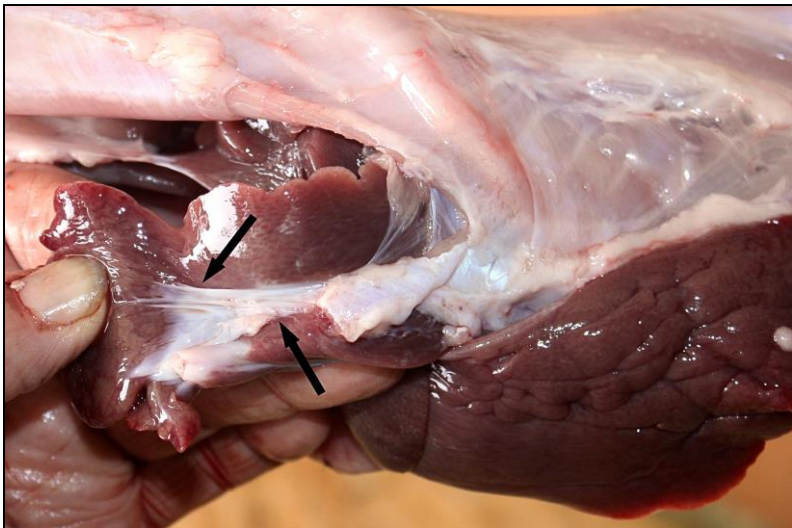


Figure 8: Visceral adhesions linking the liver to the abdominal wall. Photo: Michel Gruaz.

Treatment option

There is no treatment except the surgical approach. It aims to bring intestine or stomach back into the abdominal cavity and close the abdominal muscle wall. This approach has been used successfully in pet rabbits.

Once the rabbit is under general deep anesthesia, an incision is made through the skin covering the hernia. One method

involves retracting the edges of the skin and separating the skin from the peritoneum, the membrane that surrounds the digestive organs, up to the umbilical ring. A mass then becomes visible, that of the content of the hernia which is pushed back into the abdomen. The size of the hernia sac is reduced and the remainder is sutured to the surrounding ring. The remainder is introduced into the abdomen before closing the umbilical ring or the white line scar ring with mattress sutures. The skin is sutured in the same way.

Antibiotic treatment is needed to prevent infection of the wound, even if it is rare. Meloxicam is given during a few days reduces pain. Complications are rare and relapse recurrence is almost zero.

References

Boucher S. , Sauvaget S. , Nicolier A., 2017. Application de médicament cicatrisant sur l'ombilic du lapin nouveau-né : Intérêt pour son transport à l'âge de 3 jours. 17èmes Journées de la Recherche Cunicole, Le Mans, 21-22 Nov. 2017, 25-28

Chin E. Jr.. (1957).The rabbit : an illustrated anatomical guide. University of the Pacific, Thesis. https://scholarlycommons.pacific.edu/uop_etds/1366

Monsang WS, Baishya MP, Kumar M, Roy J, Saumen, Pal K. A Rare Case of Umbilical Hernia in a Chinchilla Rabbit (*Oryctolagus cuniculus*): Its Surgical Management. J Adv Vet Research 2014; 4:149-151.

Van Praag E., Maurer A., Saarony T. "Skin Diseases of Rabbits". Geneva, CH: MediRabbit.com; 2010.