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PRACTICAL SUBSTANTIATION OF THE EFFECTIVENESS OF OPERATIVE METHODS OF TREATMENT OF RENNET DISLOCATION

ЖУМУРДУН (АВОМАSUM) ЖЫЛЫШУУСУН ОПЕРАТИВДҮҮ ДАРЫЛООНУН ЭФФЕКТИВДҮҮЛҮГҮНҮН ПРАКТИКАЛЫК НЕГИЗДЕМЕСИ

ПРАКТИЧЕСКОЕ ОБОСНОВАНИЕ ЭФФЕКТИВНОСТИ ОПЕРАТИВНЫХ МЕТОДОВ ЛЕЧЕНИЯ СМЕЩЕНИЯ СЫЧУГА

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PRACTICAL SUBSTANTIATION OF THE EFFECTIVENESS OF OPERATIVE METHODS OF TREATMENT OF RENNET DISLOCATION

Abstract

Increased milk potential of animals often leads to disturbance of substance metabolism and appearance of various diseases. Displacement of rennet causes serious economic damage to livestock farms, including reduction of milk productivity, culling, attrition of sick animals, organization of preventive measures and treatment costs. Moreover, after treatment it is impossible to exclude completely the recurrence of this pathology, in some animals we can diagnose the displacement of the abomasum again. In this regard, the aim of our research was to study the comparative effectiveness of operative methods of treatment of rennet displacement. Two groups of 10 cows each with rennet displacement of different age were formed for the research. As a result of the conducted researches, we found out that application of the method of operative suturing of the rennet to the abdominal wall, in the area of the right hungry fossa, is the most effective and reduces the time of recovery of milk productivity in the cow, as well as minimizes the appearance of recurrences of the disease. Treatment efficiency was 80% in the 1st experimental group and 100% in the 2nd experimental group. Recovery in the 1st experimental group came on average on 12,2±1,4 days, in the 2nd experimental group on average on 10,3±1,2 days. The economic efficiency of using the puncture method of treatment, taking into account postoperative therapy amounted to 49,1 rubles, and the economic efficiency of using the surgical method of treatment by suturing the rennet through the right gluteal fossa, taking into account postoperative therapy amounted to 49,3 rubles.

Keywords: cattle, left-sided rennet displacement, puncture method, suturing method, laparotomy, operative method of treatment.

ЖУМУРДУН (ABOMASUM) ЖЫЛЫШУУСУН ОПЕРАТИВДҮҮ ДАРЫЛООНУН ЭФФЕКТИВДҮҮЛҮГҮНҮН ПРАКТИКАЛЫК НЕГИЗДЕМЕСИ

Аннотация

Малдын сүт потенциалынын өсүшү көбүнчө зат алмашуунун бузулушуна жана ар кандай оорулардын пайда болушуна алып келет. Абомасумдун жылышы мал чарба фермаларына олуттуу экономикалык зыян келтирет, анын ичинде сүт өндүрүүнүн азайышы, ооруган малды жок кылуу, профилактикалык иш-чараларды уюштуруу жана дарылоого кеткен чыгымдар. Анын үстүнө, дарылоодон кийин, бул патологиянын кайталанышын толугу менен жокко чыгарууга мүмкүн эмес, кээ бир жаныбарларда абомасумдун жылышын кайра аныктоого болот. Ушуга байланыштуу биздин изилдөөбүздүн максаты абомасумдун жылышын дарылоонун хирургиялык ыкмаларынын салыштырмалуу натыйжалуулугун изилдөө болгон. Изилдөө иштерин жүргүзүү үчүн ар бири 10 баштуу, көчүрүлгөн абомасумдуу, ар кандай жаштагы уйлардын эки тобу түзүлдү. Изилдөөлөрүбүздүн натыйжасында биз оң ачка чуңкурдун аймагында абомасумду ич дубалына хирургиялык тигүү ыкмасын колдонуу эң эффективдүү жана сүттү калыбына келтирүү убактысын кыскартаарын аныктадык, ошондой эле оорунун кайталанышын азайтат. Дарылоонун эффективдүүлүгү 1-эксперименталдык топто 80%, 2-эксперименталдык топто 100% түздү. 1-эксперименталдык топто калыбына келтирүү орточо 12,2±1,4 күн, 2-эксперименталдык топто 10,3±1,2 күн болгон.

ПРАКТИЧЕСКОЕ ОБОСНОВАНИЕ ЭФФЕКТИВНОСТИ ОПЕРАТИВНЫХ МЕТОДОВ ЛЕЧЕНИЯ СМЕЩЕНИЯ СЫЧУГА

Аннотация

Увеличение молочного потенциала животных часто приводит к нарушению обмена веществ и появлению различных заболеваний. Смещение сычуга наносит серьезный экономический ущерб животноводческим хозяйствам, включая снижение молочной продуктивности, выбраковку, выбытие больных животных, организацию профилактических мероприятий и затраты на лечение. Более того, после проведенного лечения, полностью исключить рецидив данной патологии невозможно, у некоторых животных мы можем повторно диагностировать смещение сычуга. В связи с этим, целью наших исследований явилось изучение сравнительной эффективности оперативных методов лечения смещения сычуга. Для проведения исследований были сформированы две группы коров по 10 голов в каждой со смещением сычуга, разного возраста. В результате проведённых исследований, нами установлено, что применение метода оперативного подшивания сычуга к брюшной стенке, в области правой голодной ямки, является наиболее эффективным и сокращает время восстановления молочной продуктивности у коровы, а также, минимизирует появление рецидивов заболевания. Эффективность лечения составила в 1-й опытной группе 80%, в 2-й опытной группе - 100%. Выздоровление в 1-й опытной группе наступало в среднем на 12,2±1,4 день, в 2-й опытной группе в

Операциядан кийинки терапияны эсепке алуу менен көзөө дарылоо ыкмасын колдонуунун экономикалык эффективдүүлүгү 49,1 рублду түздү, операциядан кийинки терапияны эске алуу менен оң ачка чуңкур аркылуу абомасумды хирургиялык тигүү ыкмасы менен дарылоонун экономикалык эффективдүүлүгү 49,3 рублду түзгөн.

Ачкыч сөздөр: бодо мал, абомасумду сол жакка жылдыруу, көзөө ыкмасы, тигүү ыкмасы, лапаротомия, хирургиялык дарылоо ыкмасы.

среднем на 10,3±1,2 день. Экономическая эффективность применения метода лечения проколом, с учетом послеоперационной терапии составила 49,1 руб., а экономическая эффективность использования метода лечения оперативным методом подшивания сычуга через правую голодную ямку с учетом послеоперационной терапии составила 49,3 руб.

Ключевые слова: крупный рогатый скот, левосторонне смещение сычуга, метод прокола, метод подшивания, лапаротомия, оперативный метод лечения.

Introduction

Dislocation of the rennet is a common disease of high-yielding cows that causes significant economic damage to dairy farms. In some farms, cases of the disease are rarely reported, while on some farms the incidence can be significant. According to a number of researchers, the displacement of rennet in cows is observed from 0,5 to 4,5% of the total population. The disease causes great economic damage due to reduction of milk productivity, culling (slaughter) of sick animals, organization of preventive measures and treatment costs. It is established that a cow with displaced rennet gives 557 kg of milk less than a healthy animal, and up to 30% of the loss of production occurs before diagnosis. Up to 10% of cows with this diagnosis are slaughtered or die within a few days (Plemyashov et al. 2023, pp. 48-54; Khusainova et al. 2021, pp. 70-74).

Rumen hypoplasia and hyperplasia of the rennet are caused by inadequate dry matter intake or feeding of finely chopped feed. High-yielding dairy cows over five years of age are more likely to become ill during the winter-spring period. About 90% of cases occur within six weeks of calving. Leftward displacement of the rennet is more common in animals four weeks after calving, and much less common three weeks before calving. Rarely, rennet displacement is recorded in bulls, young stock over three months of age and heifers. In young bulls and heifers, the rennet is more often displaced to the right side. According to statistics, the disease is more common in cattle and less common in sheep and goats. When displaced to the left, the rennet is located caudodorsally between the rumen and the left abdominal wall; when displaced to the right, it is located between the right abdominal wall and the intestine. Displacement of the rennet to the right is often complicated by twisting of the organ, which disrupts the progression of chyme through the digestive tract and leads to intoxication of the organism, damage to other organs and systems, which eventually leads to culling of animals or their death. (Danilkina, 2021. pp. 97-104; Plemyashov et al., 2023, pp. 3-7).

Displacement of the rennet in high-yielding cows should be considered as an expressed effect of multiple factors that generate pathology. Thus, Blednov A.I. et al. (Blednov, 2021, pp. 105-111), found that at cattle-breeding complexes the absence of pasture walking contributes to the emergence of pathology, which are raised on the closed European technology of cold loose housing, where the microclimate for cows is created by air circulation in a covered room. The animals, although moving in pens, but crowding does not allow for full-fledged motoring. In addition, a regularity in the occurrence of the disease mainly in newborn animals was revealed, which is associated with changes in the hormonal background of cows after calving and lack of the necessary amount of minerals. The main reason was the frequent change of cows' feeding ration, and fermentation of fodder masses provoked by this feeding in the pre-gastric tract on the background of hypocalcemia led to the lack of tone of contractions and displacement of rennet.

Diagnosis of the disease should be complex and consist of clinical signs, laboratory tests and ultrasound data. For example, clinical examination of cows with displaced rennet most often registers lethargy, poor appetite, decreased milk yield, pasty feces, sometimes diarrhea and bloating. Often animals have concomitant diseases, namely, mastitis, metritis, retention of the afterbirth, the presence of which can be the direct cause of poor health of animals, which leads to fermentation and accumulation of gases in the stomach (Tashlykova, 2023, p. 39-43).

Braun et al. (Braun et al., 2022, p. 40) analyzed the clinical, laboratory, and ultrasound findings of 1982 dairy cows with leftward rennet displacement (n = 1341), rightward rennet displacement (n = 338), and rennet ingestion (n = 303). They found that the main clinical manifestations were

abnormal behavior in 48,2% of cows, decreased rumen peristalsis in 89,7% and decreased intestinal peristalsis in 61,1%. Percussion and simultaneous auscultation were positive on the left in 96,9% of cows with leftward displacement of the rennet, on the right in 98,5% of cows with rightward displacement of the rennet, and in 99,3% of cows with rennet ingestion. Ultrasonography was useful in diagnosing left-sided rennet displacement in 97,9% of cows and right-sided rennet displacement/narrowing of the rennet in 90,2% of cows. Laboratory findings characteristic of rennet reflux syndrome varied in severity; 83% of cows had hypokalemia, 67% had increased rumen chloride concentration, 67% had increased base excess and 50% had hemoconcentration. Based on clinical signs, the final diagnosis was made in 75,0% of cows with left-sided rennet displacement and 22,5% of cows with right-sided rennet displacement/narrowing of the rennet. Ultrasonography was required for the final diagnosis in another 22,0% of cows with leftward displacement of the rennet and in 53,0% of cows with rightward displacement/narrowing of the rennet. Laparotomy or pathologic examination was required to reliably differentiate between right-sided rennet displacement and rennet twist.

For treatment of dairy cows with rennet displacement, various methods of treatment are offered today: medical, conservative and surgical. In the conditions of modern cattle breeding, surgical methods of treatment of rennet displacement in dairy cows are more often used. According to researches, surgical methods of treatment are more effective in comparison with conservative methods, however, successful carrying out of the operation does not guarantee full recovery of the animal. The overwhelming part of the success of the operation depends not so much on the technique of the operation itself, as on the observance of the rules of asepsis and antisepsis during surgical intervention, as well as the correct treatment and care of the animal in the postoperative period (Valeeva, 2020, p. 4).

According to Proios and Grünberg (Proios and Grünberg, 2023, p. 2887) it is very important to identify preoperative clinical, hematologic, and intraoperative parameters that are associated with a favorable outcome in rennet dislocation. The authors conducted a retrospective study of animals hospitalized in a veterinary clinic over a 6-year period with a diagnosis of rennet dislocation. A total of 234 cows were admitted to the clinic, of which 193 were discharged after treatment and thus classified as survivors. In contrast, 41 animals were euthanized because they had an unfavorable outcome after surgery. Specifically, more severe dehydration, higher heart rate, lower sodium levels, and higher preoperative blood L-lactate and phosphorus concentrations were observed compared to survivors. During surgery, the rennet in non-survivors was markedly enlarged and more frequently kinked than in survivors. The authors point out that these results may contribute to the early identification of animals with poor prognosis requiring more intensive pre- and postoperative care.

Giesteira et al. (Giesteira et al., 2023, pp. 296-297) compared two surgical methods for the treatment of leftward displacement of the rennet in dairy cows. These two methods were compared in terms of milk production at different time intervals: before surgery; on the day of surgery; and at 8, 15 and 30 days after surgery. The surgical methods used in this study were laparoscopy-guided abomasopexy (a method of suturing the pyloric portion of the rennet to the lateral abdominal wall) and right-sided laparotomy omentopexy (a surgical procedure involving the attachment of omentum on a vascular pedicle to an organ to improve blood supply). A total of 126 lactating Holstein-Friesian cows with left-sided ileum obstruction were operated on, 63 of which were treated laparoscopically and 63 by right-sided laparotomy. No differences were found between the two groups of operated cows in terms of number of days of lactation, fatness scale (BCS), rectal temperature, heart rate and

respiratory rate before surgery. No differences were observed between groups with respect to the biochemical parameters analyzed (P > 0.05), except for chloride, which had lower mean values in the omentopexy group (P < 0.05). The return of milk yield during the study period was not significantly different between the laparoscopy and laparotomy groups (P >0,05), although there was a significant change in time since surgery.

To maintain optimal cow husbandry and prevent rennet displacement, it is advised to avoid rapid dietary changes, maintain adequate amounts of roughage in the diet, prevent postpartum hypocalcemia, minimize associated diseases such as endometritis, metritis, ketosis and others. (Bakirov, Hajitov, Ulugmurodov, 2021, P. 210-214; Hertseva et al, 2020, P.21-27; Ruby, 2020 P. 72; Antanaitis et al., 2020, p. 4416).

Thus, rennet displacement is one of the most common gastrointestinal diseases in highly productive cows. Survival rate in this pathology depends primarily on early diagnosis and timely treatment.

In this connection, the aim of the research was to study the comparative effectiveness of operative methods of treatment of rennet dislocation.

In order to achieve the goal the following tasks were defined:

1. To study the distribution and causes of rennet displacement in dairy cows in the cattle-breeding complex of LLC «Severnaya Niva Bashkiria» of the Republic of Bashkortostan;
2. To study the features of clinical signs manifestation at rennet displacement in cattle;
3. To analyze the comparative efficiency of two methods of operative treatment of rennet displacement, taking into account the postoperative therapy with the use of drugs: Amoxicillin 150, Flunex, Glucose 40%, Calcium borgluconate, Reviva.
4. To substantiate the economic efficiency of operative methods of treatment of rennet displacement taking into account postoperative therapy in high-yielding dairy cows.

The object of research were high-productive dairy cows, Holstein breed, average weight 600 kg, of different age, in the amount of 20 heads, with the diagnosis of rennet displacement.

The diagnosis was made comprehensively on the basis of:

- anamnestic data;
- clinical examination of the animal, using common methods: examination, percussion, auscultation. The following were taken into account: pregnancy in animals or the period after the last calving.

Measures on treatment of cattle with displacement of rennet were carried out in the cattle-breeding complex of «Severnaya Niva Bashkiria» LLC of Ermekeyevsky district of the Republic of Bashkortostan.

In order to study the efficacy of operative methods of treatment of rennet displacement, two experimental groups of cattle of different ages, 10 animals in each group were formed (Table 1). Feeding and housing conditions were identical.

Table 1. *Scheme of research experiment*

Animal group (n=10)	Treatment method	Stage of operation	Manipulation performed
1 experimental group	Puncturing the rennet and fixing it to the abdominal wall with a fillet («puncture method»)	1	Fixation of the cow in the box standing in the headlock; perform auscultation of the rennet
		2	Inject intravenous myorelaxant (Xylant) 1 ml into the tail vein; apply the Hess sling, tumble the cow and put it in the dorsal position, fix the limbs.
		3	Repeat auscultation of the rennet, if there are characteristic sounds of «rubber sword hitting the floor», continue; prepare the operative field (shave the surgical site and treat with 5% iodine solution)
		4	Stand on the abdominal wall in front of the udder. Puncture the rennet with a trocar, 12 cm from the edge of the scutellum toward the tail and 5 cm from the white line to the left
		5	After the puncture, take the stellet out of the trocar, make sure that the puncture is correct - exit of rennet gases; insert the retainer into the rennet and pull out the trocar sleeve
		6	Secure the rennet with the lining, keeping it in a taut position
		7	Make a second puncture in the abomasum, 5 cm below the first one, do the same manipulations
		8	Tie the stitches together at a distance of 6-8 cm from the abdominal wall, placing a gauze roll moistened with 5% iodine solution; treat the puncture site with antibacterial spray «Fortiklin»
		9	Provide postoperative therapy; cut off the bandage after 14 days
2 опытная группа	Оперативное подшивание сычуга к брюшной стенке, через правую голодную ямку, путем лапаротомии. («метод подшивания»)	1	Fixing the cow in the box standing in the headlock
		2	Prepare the surgical field of the right fossa: shave the incision site; wash with soap and water the shaved area and another 20 cm around the perimeter; treat the incision site with 5% iodine solution
		3	Administer intravenous myorelaxant (Xylant) 1 ml into the tail vein. Perform conductive blockade of the lumbar nerves (20 ml to each point) and local infiltration anesthesia at the site of dissection (40 ml) with 2% novocaine solution.
		4	Cut through the skin; cut through the outer layers of muscle; cut through the inner layer of muscle; cut through the peritoneum
		5	Release rennet gases: lean the cut of the needle against the index finger to prevent injury to internal organs; pass the hand under the sacrum behind the ligament on the left side; release rennet gases using the needle and system, with the reverse end of the system in water.
		6	Pass the hand, along the right rib wall to the pylorus of the rennet and the 12-intestine (the tightest place); pull the rennet by the pylorus to the right side and over the edge of the wound
		7	Suture the wall of the rennet in the pylorus to the peritoneum in the lower corner of the surgical wound with 3-5 stitches
		8	Pour 100 ml of Amoxicillin into the abdominal cavity
		9	Suture: peritoneum, inner layer of muscles, outer layer of muscles with a simple wraparound suture (catgut); suture the skin with a continuous Multan suture (polycone), or sew with steel clips. Treat the suture with antibacterial spray «Fortiklin»
		10	Provide postoperative therapy; remove sutures or clips after 14 days

After the performed surgeries for animals from the first and second experimental groups, postoperative therapy was obligatory (Table 2).

Table 2. *Scheme of drug administration for postoperative therapy*

The drug	Method of administration	Dose, ml	Treatment days				
			1	2	3	4	5
Amoxicillin (semisynthetic penicillin antibiotic)	Intramuscular	50	+		+		+
Flunex (non-steroidal anti-inflammatory drug)	Intramuscular	20	+	+	+	+	+
Glucose 40% (means for rehydration and detoxification, for correction of hypoglycemia)	Intravenously	400	+	+	+		
Calcium borgluconate de-sensitizing, anti-toxic and anti-inflammatory effects)	Intravenously	400	+	+	+		
Reviva (feed additive for maintaining physiological status of dairy cows after calving)	Inside (solution)	30000	+	+	+		

The efficacy of operative methods for the treatment of rennet displacement in each group was evaluated according to the following criteria:

1. Positive dynamics (daily general examination of animals);
2. Duration of treatment, days.

The economic efficiency of veterinary measures was determined according to the «Methodology for determining the economic efficiency of veterinary measures», compiled by Y.E. Shatokhin and I.N. Nikitin.

Determined:

- total (actual): economic damage from reduction of animal productivity;
- prevented economic damage;
- veterinary costs;
- economic effect obtained as a result of treatment measures;
- economic effect of treatment measures per 1 ruble of costs.

Statistical processing of digital data was performed using the statistical analysis package for Microsoft Excel. Reliability of differences between groups by quantitative characteristics was assessed using Student's t-criterion.

The analysis of bovine diseases spread in the cattle breeding complex of Severnaya Niva Bashkiria LLC was carried out taking into account the materials of veterinary reports of the farm: logs for registration of sick animals (agricultural accounting, form No. 1-VET), logs for recording anti-epizootic measures (agricultural accounting, form No. 2-VET), logs of animal disposal (slaughter), logs of disinfection, disinsection, deratization and acts of disinfection, disinsection and deratization in sectors, reports on contagious animal diseases (Form No. 1- VET), on anti-epizootic measures (Form No. 1-VET A), on non-communicable animal diseases (Form No. 2-VET), autopsy

reports and protocols, results of laboratory tests of biomaterial from sick animals for 2021-2023 (Table 4).

Table 4. *Disease prevalence among high-yielding cows in the cattle-breeding complex of Severnaya Niva Bashkiria LLC*

No. n/a	Disease	Research period, year		
		2021	2022	2023
1	Dislocation of the rennet	121	158	167
2	Ketosis	258	166	150
3	Nonspecific pneumonia	1111	1292	797
4	Mastitis	1516	1356	525
5	Metritis	898	963	540
6	Postpartum retention	222	276	252
7	Postpartum paresis	13	63	26

When analyzing the spread of diseases among cattle, we found that non-specific pneumonia, obstetric and gynecological diseases (metritis, mastitis) and rennet displacement are the most frequently registered. We also found that the number of cases of rennet dislocation is increasing. In 2021, the incidence of rennet dislocation among dairy herds was 4.3%, and in 2022 it was 5.6%.

In 2022, 158 cases of rennet dislocation were reported. Of these, 105 animals used the «puncture method» and 43 had postoperative complications and herd dropout (41%); 53 animals used the «operative rennet stitching method» and only 17 had postoperative complications (32%). Based on the 2022 data, the success rate for the «puncture method» is 59% and for the «operative suturing method» is 68%. In addition, many cows that were treated with the «puncture method» had recurrences of the disease, so in this case the repeated surgical treatment was performed using the «method of operative suturing of the abomasum». Since the beginning of 2023, the farm has been increasingly using the «operative suturing method» for the treatment of rennet pathology.

Most often, abnormalities of the rennet were found in newborn cows, as these animals may have postpartum rushes, retention of the afterbirth, and the cow is weak, depressed and malnourished.

We have analyzed the causes causing displacement of the abomasum in postpartum cows. We identified the following groups of causes:

- displacement of the rennet due to calving, because the vacated space in the abdominal cavity after calving and the small filling of the rumen, give the rennet space, allowing it to displace;
- the presence of secondary diseases in the animal provoke displacement of the rennet, as many diseases lead to the fact that the cow does not show appetite for feed, does not eat, thus provokes fermentation and accumulation of gases in the rennet, resulting in «popping» of the organ;
- consumption of concentrate-rich feed after calving can also increase gas formation in the rennet, leading to its displacement.

The main clinical signs recorded in cattle with rennet pathology are shown in Table 5.

Displacement of the abomasum was most commonly seen in postpartum animals (immediately or one month later), but was also seen in pregnant animals. The cause of rennet displacement was often the presence of secondary diseases such as metritis. As a result of secondary diseases, the general condition of the animals worsened, there was oppression, decreased appetite, which often

provoked the appearance of abnormalities of the abomasum in the form of its displacement. Aggravating factors that can provoke rennet displacement were also: hypocalcemia (leads to decreased tone of rumen muscles, hypotonia of pancreas, decreased feed intake, which leads to rumen acidosis or rennet displacement), feeding a large amount of concentrated feed.

Table 5. *Main clinical signs of rennet dislocation in cows*

Number of animals animals, heads	Clinical signs
20 (100%)	
17 (85%)	Oppression, decreased appetite
20 (100%)	Body temperature within 38,6 ± 0,4°C
13 (65%)	Increase in heart rate, by 5,9±2,5 beats/minute
12 (60%)	Respiratory rate 26,0±2,8 per minute
20 (100%)	Decrease in milk productivity
16 (80%)	Lack of chewing
16 (80%)	Reduced appetite
18 (90%)	Dark with specific odor pasty consistency feces
20 (100%)	Presence of ringing sounds and liquid splashes in rennet (percussion), at percussion with simultaneous auscultation in the last three intercostals - sound of «baseball sword hitting the floor».

During clinical examination of cows with displaced rennet, we noted that body temperature was within normal limits, some animals had increased heart rate and respiratory rate, oppression, decreased appetite, lack of chewing. The main clinical sign was a decrease in milk productivity, which was observed in all animals with this disease.

To conduct research on studying the effectiveness of surgical treatment methods for rennet displacement in cattle, 20 high-yielding dairy cattle of different ages were selected (Table 6).

The cows included in the experiment were continuously monitored for 14 days. Attention was paid to the appetite of animals and their water consumption, the condition of the operation site (puncture or suture site), as well as the dynamics of milk productivity recovery (Table 6).

Table 6. *Comparison of therapeutic efficacy of treatment methods*

Groups	Days of observation				
	Before treatment	1st	3rd	6th	14th
Temperature, °C (physiological norm 37,5 – 39,5 °C)					
1	38,2 ± 0,3	38,8±0,4	38,7±0,2	38,0±0,5	38,4±0,2
2	38,21± 0,4	38,4±0,2*	38,5±0,1	38,1±0,3*	38,5±0,2
Heart rate, beats/min (physiological norm 50 - 80 beats/min).					
1	85,6±2,3	76,2±2,0	72,0±0,5	67,0±0,9	65,0±1,0
2	85,3±2,5	73,4±1,0	70,0±0,8*	65,0±1,0	64,0±1,3
Respiration, breaths/min (physiologic norm 12 - 25 breaths/min)					
1	27,4±0,5	22,0±0,5	19,0±0,2	16,0±1,8	17,0±1,0
2	27,0±0,6	19,0±0,4*	20,0±0,15	17,3±1,0	16,2±1,2*

Clinical examination					
1	Depressed state, appetite is reduced, gum is absent, at percussion and simultaneous auscultation in the last three intercostals there are sounds of «hitting a baseball», milk production is reduced.	General condition - satisfactory, appetite appeared, gum is present, sounds at au-sultation and per-cussion, blunted or thyme-panic.	Appetite is decreased, gum is present, general condition - satisfactory.	Appetite is good, general condition is good.	Appetite is good, general condition is normal.
2	Depressed state, appetite is reduced, chewing is absent, at percussion and simultaneous auscultation in the last three intercostals the presence of sounds of «baseball impact», milk production is reduced.	General condition - satisfactory, appetite appeared, gum is present, sounds at au-sultation and per-cussion, blunted or thyme-panic.	Appetite is preserved, gum is present, general condition is good.	Appetite is good, general condition is good.	General condition and appetite are normal.

* - $P \leq 0,05$

On the 1st, 3rd, 6th, and 14th days, body temperature was measured (by rectal thermometer), pulse was measured (by heartbeat), and respiratory rate was counted for one minute using a phonendoscope.

On the first day after surgical treatment, the general condition of cows in both groups was satisfactory. The animals had cud, appetite appeared a little. Temperature was within normal limits, pulse and respiration were above normal.

On the 14th day of the operation the results of treatment were evaluated. Those animals with no clinical signs of the disease and restored milk production were considered recovered (Table 6).

The results of effectiveness of operative methods of treatment for rennet displacement among high-yielding dairy cows are presented in Table 7.

Table 7. *Results of effectiveness of operative methods of treatment of rennet displacement*

Indicators	1st experimental group	2nd experimental group
Number of animals, head	20	
Diseased, head	10	10
Average duration of disease	12,2±1,5	10,3±1,2
Recovered, head	8	10
Treatment efficiency, %	80	100

Treatment efficiency was 80% in the 1st experimental group and 100% in the 2nd experimental group. In the first experimental group the recovery period took 12,2±1,5 days, in the second - 10,3±1,2 days. We also analyzed the recovery of milk productivity in cows after surgical treatment of rennet displacement (Table 8).

Table 8. *Dynamics of milk productivity recovery in cattle*

Average daily milk yield, l	1st experimental group	2nd experimental group
Healthy cows, l (average for the farm)	36,8±3,53	
1st day	16,06±2,3	16,61±3,7
3rd day	17,11±4,68	22,05±5,15
6th day	24,83±3,58	31,93±3,98
9th day	26,7±3,34	32,28±5,82
10th day	28,96±2,89	33,98±3,85
12th day	29,8±3,54	34,93±3,91
14th day	30,02±3,58	34,77±2,86

According to the data in Table 8, it can be seen that in the 2nd experimental group the rate of recovery of milk productivity is slightly higher than in the 2nd experimental group. Daily milk yield on the 10th day in the 2nd group averaged 33,98±3,85 liters, while in the first group only 28,96±2,89 liters.

Thus, it can be concluded that the method of rennet suturing through the right hungry fossa showed the highest efficiency compared to the rennet puncture method.

Economic damage from rennet displacement in cattle consists of decrease in animal productivity, premature culling of animals and additional costs for treatment and preventive measures (Table 10).

Table 10. *Cost-effectiveness of treatment of rennet displacement in cattle*

Animal group	Economic efficiency indicators				
	Total economic loss, rubles.	Veterinary costs, rub.	Prevented economic damage, rubles.	Economic effect, rubles.	Economic effect per ruble of costs, rubles.
1st experimental group	89 596,8	37 298,14	1 870 000	1832 701,86	49,1

2nd experimental group	72 684	37 152,34	1 870 000	1832 847,66	49,3

We found that the payback per ruble of invested costs in the 1st and 2nd experimental groups of cattle receiving complex treatment amounted to 49,1 rubles and 49,3 rubles, respectively.

Thus, the following conclusions can be drawn:

1. When studying the distribution of rennet displacement in the livestock complex of LLC «Severnaya Niva Bashkiria» we found that in 2021 the percentage of morbidity among dairy stock was 4,3%, in 2022 – 5,6%. Most often, this disease manifested itself in animals after calving, after 2-4 weeks, a significant role is also played by feeding, lack of motility and the presence of concomitant diseases.

2. Among the main clinical signs were observed: loss of appetite, absence of chewing, insufficient rumen filling, appearance of «ringing» or the sound of a «basketball kick» during auscultation and percussion of the last intercostal space. Body temperature most often remained within normal limits.

3. The studies showed that the effectiveness of treatment amounted to 80% in the 1st experimental group and 100% in the 2nd experimental group. The use of the method of operative podshivanie will reduce the time of recovery of the animal and its milk productivity, the risk of recurrence in this method of treatment is minimal.

4. Payback per ruble of invested costs in the first group («puncture method») and the second group («suturing method») of highly productive cows amounted to 49,1 rubles and 49,3 rubles, respectively.

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