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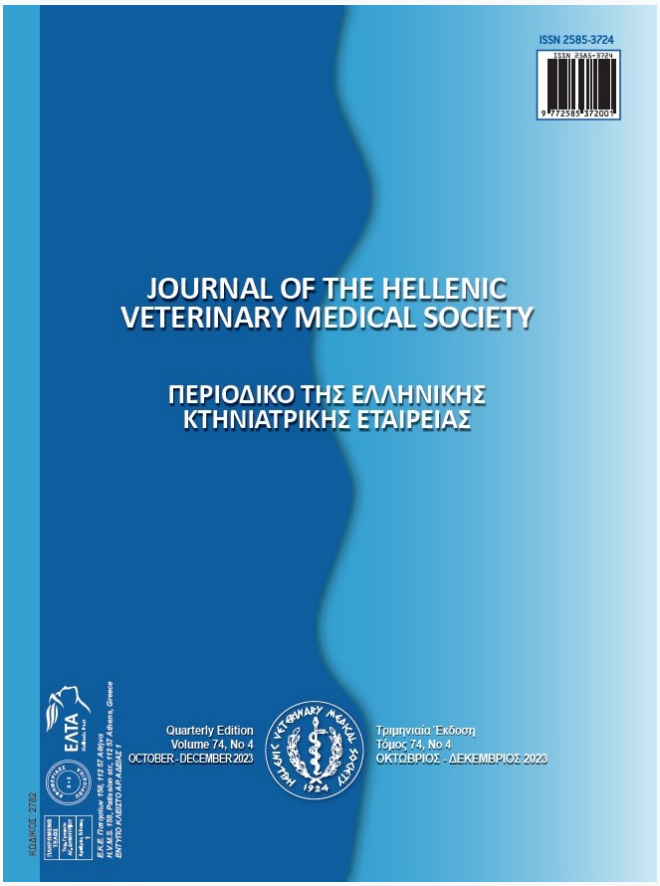

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Research article
Ερευνητικό άρθρο

The effect of early postpartum administration of intrauterine povidone-iodine on the postpartum period in Holstein cows

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ABSTRACT: Uterine diseases in cows are caused mainly by bacterial contamination after parturition.This study aimed to reveal the possible effects of intrauterine povidone-iodine solution on the postpartum involution process and, subsequently, to identify the outcomes of infectious and reproductive statements. The study group (n=34) and the control group (n=35) received intrauterine povidone-iodine (2%) and 0.9% NaCl, respectively, within 24 hours of parturition, both in a volume of 100 ml. In order to monitor the involution process in the groups rectal body temperatures (daily for eight days), placental expulsions (Score 1: 0-6 hours, Score 2: 6-12 hours, Score 3: 12-24 hours, Score 4: placental retention), characteristics (Score 1: none/lucent, Score 2: bloody/chocolate colored, Score 3: mucopurulent/purulent) and odor (odorless/malodorous) of uterine discharge were evaluated. The uterus's diameter was measured on ultrasound imaging to monitor uterine involution in both groups. Uterine infections were evaluated by clinical observations. Bacterial content of uterus was evaluated with microbiological sampling. The pregnancy rates of first, second, and third insemination, and the insemination index parameters in each group were calculated in three separate periods; until the postpartum 80th, 150th, and 400th days. There was no statistical difference between the groups regarding involution process parameters, uterine involution, uterine infections and fertility parameters (P>0.05). It was concluded that intrauterine %2 povidone-iodine administration at a volume of 100 ml in the early postpartum period had no different effect on reproductive performance than its isotonic saline solution.

***Keywords*:** cow; fertility; metritis; reproductive performance

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INTRODUCTION

One of the primary goals of the cattle industry is to obtain one newborn calf from each cow every year. Puerperium disruptions can result in missed targets, increased labor and treatment costs, extended open days, and even higher culling rates, resulting in financial losses. Furthermore, using antibiotics and hormones to treat postpartum uterine infections is costly (Palmer, 2003) and can cause hormone or antibiotic residues in antibiotic-resistant bacteria. Therefore, preventing uterine infections before they occur appears to be more beneficial (Galvão et al., 2009). Various studies have been conducted to improve the uterine involution process to prevent placental retention and uterine infections (Sheldon et al., 2003; Otero et al., 2006; Pancarcı et al., 2009; Machado et al., 2012; Meira et al., 2013; Ametaj et al., 2014; Machado et al., 2014). All postpartum preventive interventions aim to increase contractility, hasten the involution process, activate innate immunity, and reduce the number of microorganisms or pathogens' harmful effects in the uterus.

Intrauterine antiseptic infusions are an alternative treatment widely used in veterinary medicine (Pandey et al., 2011). Iodized antiseptics such as Lugols' solution and povidone-iodine have been used to increase fertility in the postpartum period (Yamamoto et al., 1996), treat inactive ovaries (Hillman and Gilbert, 2007) and treat uterine infections, particularly endometritis (Yoshida et al., 2020). It has been well-known that uterine contraction increases, mucosal hyperemia occurs, and blood flow accelerates after intrauterine infusion (Bretzlaff, 1987). Iodine solutions cause regional irritation in local administration. Local irritation of the uterus promotes endometrial regeneration and the release of endogenous prostaglandins (Carleton et al., 2008).

This study aimed to reveal the effects of intrauterine povidone-iodine administration in the early postpartum period on various inflammatory and infectious risk parameters that may occur during the postpartum involution process. Besides, it aimed to reveal this administration's possible long-term effects on fertility.

MATERIALS AND METHODS

The study was carried out on a commercial dairy farm with the approval of the Samsun OndokuzMayıs University Ethics Advisory Committee (2012-33). The animal material consisted of 69 Holstein-Friesian cows, aged 2-5 years that were clinically healthy during the last 20 days of pregnancy. To minimize the harmful effects of cold weather (Cengiz et al., 2022) only cows that calve between October and December were included in the study. The selection criteria for cows were that they give birth naturally without any assistance. The mean body condition score of the cows was 3.28 (2.9-3.6) according to the California technique. Intrauterine treatments were performed according to a schedule determined at the beginning of the study (alternating three days with povidone-iodine and three days with isotonic saline).

Consequently, the researchers utilized blind selection to divide the group. Cows were divided into the study group (SG, n = 34) and the control group (C, n = 35). The same veterinarian performed all the intrauterine administration and follow-up examinations.

Povidone-iodine solution (%10, Poviofix, Naturel, Turkey) was used as stock solution. The stock solution was diluted 1/5 with distilled water to reduce the iodine concentration to the previously recommended (Nakao et al., 1998) dilution of 2%. Within 24 hours pp, SG received a 100 ml intrauterine (Koujan et al., 1996) %2 povidone-iodine solution via a metal bovine uterine catheter (43 cm, Kruuse, Denmark). In contrast, C received a sterile commercial isotonic saline solution (Biofleks, Osel, Turkey) via the same volume and procedure.

Rectal body temperatures were measured once a day between day 0 (d0) and d8 with a digital thermometer (pM-101, Plusmed, Turkey) at the same time of a day (15:00-16:00). The placental expulsion time (Score 1: up to 6 hours, Score 2: 6-12 hours, Score 3: 12-24 hours) and placental retention (Score 4: over 24 hours) were recorded. Cases of placental retention were treated according to the farm-followed schedule (manual intervention of the placenta at three days pp, followed by intrauterine chlortetracycline).

Vaginal discharge was evaluated according to its character (Score 1: none/lucent mucus, Score 2: bloody/chocolate colored mucus, Score 3: mucopurulent/purulent mucus) and odor (Odorless or malodorous) every five days from d5 to d40.

A B-mode real-time portable ultrasonography device (Honda Electronics, HS-2100V, Japan) with 5-10 MHz linear probe equipment was used for ultrasound imaging. The diameters of the cervix, previously pregnant horn (PH), and non-pregnant horn (NPH) were measured every 5 days between d20 and d40.

The width of the uterine horn was measured by placing the probe in the transverse position approximately 4 cm cranial to the uterine bifurcation. The process of uterine involution was considered complete if; i) there was no remarkable difference in the diameters of the PH and NPH on ultrasound imaging, and ii) the entire PH was palpated in the pelvic cavity on rectal palpation.

Microbiological samples were taken twice: on d15 and on the first day of estrus. Sterile disposable swabs (CultiplastLpItalianaSpA, Italy) were inserted into the uterus from the cervical os. Samples were taken during speculum inspection to avoid contact with the vaginal walls. Colonies obtained after 24 and 48 hours of incubation on 5% sheep blood agar at 37°C in an aerobic incubator (Memmert, England) were identified using conventional culture identification methods.

Uterine infections were classified into puerperal metritis and clinical endometritis (modified from Sheldon et al., 2006) based on body temperature, character and odor of vaginal discharge. Severe acute puerperal metritis cases were treated according to the farm-followed schedule (Ceftiofur, Cevaxel® RTU, 50 mg/ml ceftiofur, 100 ml, Ceva Animal Health Inc. and ketoprofen, Ketobay®, 100 mg/ml ketoprofen, 50 ml, Bayer Animal Health Inc.)

Estrus was detected by observing estrus behaviors and monitoring pedometric activity through a computerized herd recording system (Dairyplan®, GEA Farm Technology, GEA Group). Cows were inseminated artificially by the same veterinarian starting from day 45 pp. First insemination pregnancy rate (FIPR), second insemination pregnancy rate (SIPR), third insemination pregnancy rate (TIPR), and insemination index (II) parameters were calculated after artificial inseminations till the day 80, 150, and 400 pp.

SPSS 22.0 statistical package program was used for data analysis. The t-test was used to determine differences in body temperature, cervix, PH, and NPH diameters. The Chi-square test was used to compare the groups' character and odor scores of vaginal discharges, uterine infections, placental expulsion time, retention rate, and fertility parameters. P values of less than 0.05 were regarded as statistically significant differences.

RESULTS

Two of the study group's cows, who had puerperal metritis and retained placenta, were excluded from the subsequent examinations due to their poor health. Likewise, five cows in the control group were excluded due to various problems (acute mastitis, traumatic injury, peritonitis, abomasum displacement, and puerperal metritis). Healthy cows were not used to replace cows removed from the groups. Only the placental expulsion time and body temperature of these cows were evaluated.

The scores regarding the time of placenta expulsion in SG were; Score 1: 20.6% (7/34), Score 2: 44.1% (15/34), Score 3: 23.5% (8/34) and Score 4: 11.8% (4/34). The scores regarding the time of placenta expulsion in C were; Score 1: 25.7% (9/35), Score 2: 40.0% (14/35), Score 3: 14.3% (5/35), and Score 4: 20.0% (7/35). There was no statistically significant difference ($P>0.05$) in placental expulsion time rates between groups.

Postpartum body temperature was higher than 39.5 °C for at least one day in 11 of 34 SG cows (32.35%) and 12 of 35 C cows (34.28%). There was no statistically significant difference ($P>0.05$) in average body temperature values between groups on examination days (Figure 1).

The vaginal discharge score rates on examination days in the groups are given in Figure 2. Score 2 (bloody/chocolate colored mucus) on d5 in SC (26/32 or 81.25%) was ceased on d20. Score 2 on d5 in C (23/30 or 76.66%) was ceased on d25. Obvious vaginal discharge on d40 was lucent mucus (Score 1) in both groups (Score 1: 22/32 and 21/30, Score 2: 1/32 and 0/30, Score 3: 3/32 and 9/30 in SG and C, respectively). Mean vaginal discharge character scores on the examination days were not statistically significant between SG and C ($P>0.05$). Similarly, the odor of vaginal discharge was not statistically significant ($P>0.05$) on days of examination between SG and C (Figure 3).

There was no statistically significant difference between SG and C in mean PH, NPH and cervical diameters on any examination day ($P>0.05$). At d30, the difference between the mean PH diameters of the groups was less than 1 mm. Similarly, NPH and cervix diameters became nearly equal on d35. Figure 4 depicts the mean cervix and uterine horn diameters on SG and C.

The uterus was palpated in the abdominal cavity 14 out of 32 (40.62%) in SG and 19 out of 30 in C

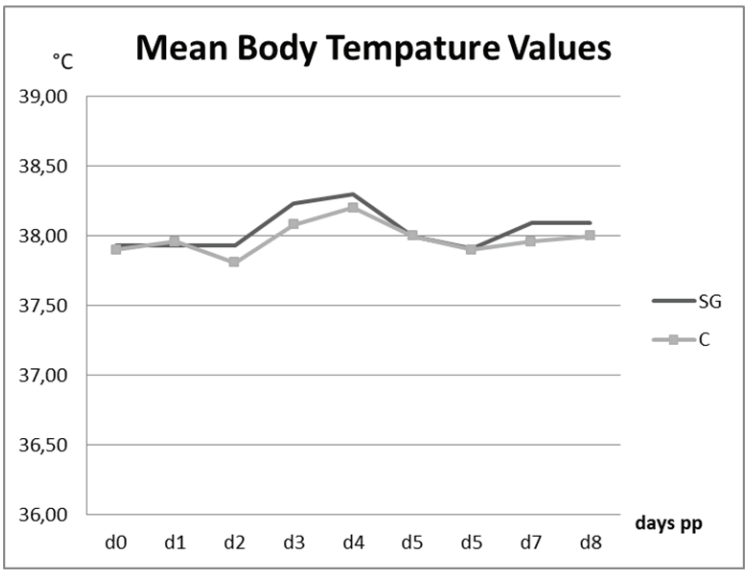

Figure 1. The mean body temperature values on group (SG: Study Group, C: Control Group)

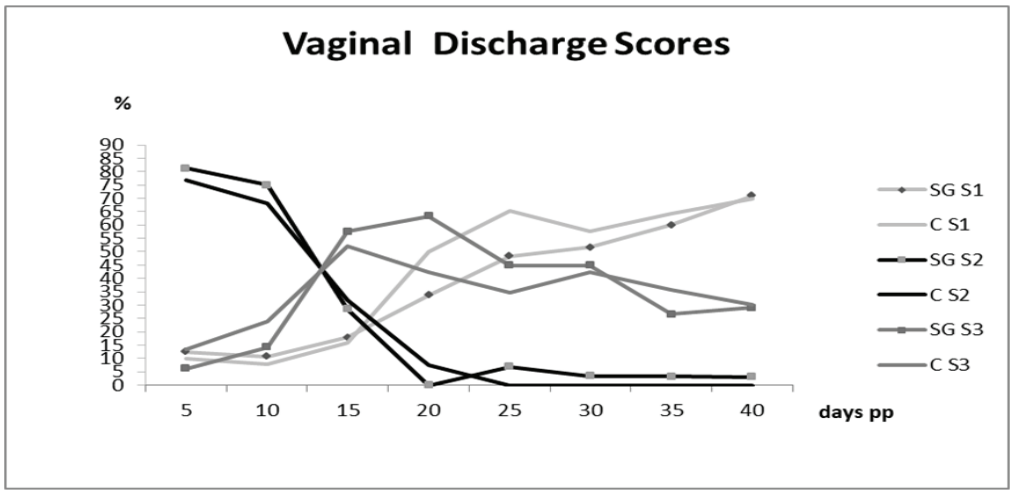

Figure 2. Proportional variation of vaginal discharge scores in SG and C (SG S1: study group Score 1, CS1: Control group Score 1, SG S2: study group Score 1, CS2: Control group Score 2, SG S3: study group Score 3, CS3: Control group Score 3, Score 1: no discharge /clear mucoid, Score 2: bloody / chocolate colored mucus, Score 3: purulent/mucopurulent mucus)

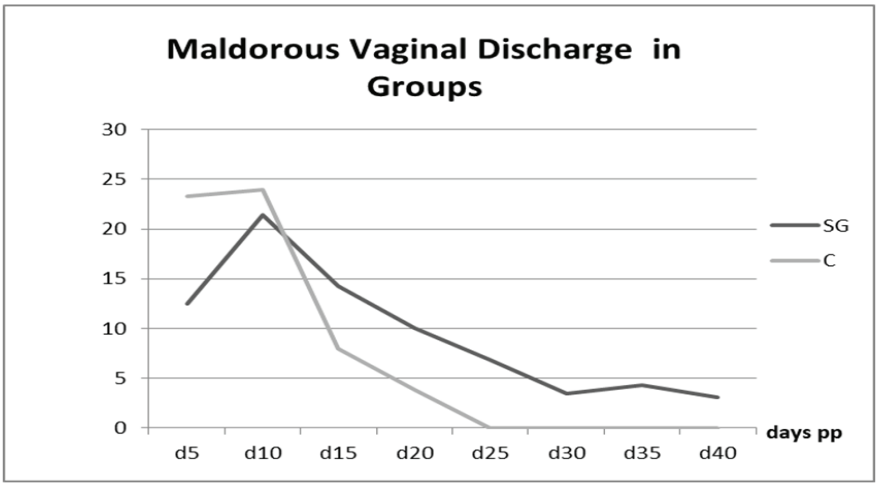

Figure 3. Presence of malodorous vaginal discharge in SG and C

(63,33%) on d15, while the proportion decreased to 1 of 32 (3.12%) in SG and 5 out of 30 (16,66%) in C on d20. The uterus was palpated in the pelvic cavity of 18/32 (56.25%) cows of SG on d25 and 20/30 (66.66%) cows of C on d35.Figure 5 and Figure 6 show the uterine position ratios on examination days in SG and C.

The uterine involution process was incomplete in 2/32 of SG cows (6.25%) and 6/30 of C cows (20%) by d40, the end of clinical examinations. Figure 7 shows the cumulative completion of uterine involution in the groups.

Puerperal metritis has occurred in 10/32 (32%) of SG cows, 3/10 (30%) of which had recovered spontaneously up to d20, 5/10 (50%) of which subsequently developed clinical endometritis and 2/10 (20%) of which was culled. Puerperal metritis has occurred in 7/35 (20%) cows in C, 1/7 (14.28%) of which had recovered spontaneously up to d20, 5/7 (71.42%) of which subsequently developed clinical endometritis, 1/7 (14.28%) of which was culled. Puerperal metritis developed in 100% (4/4) of SG cows and 42.85%

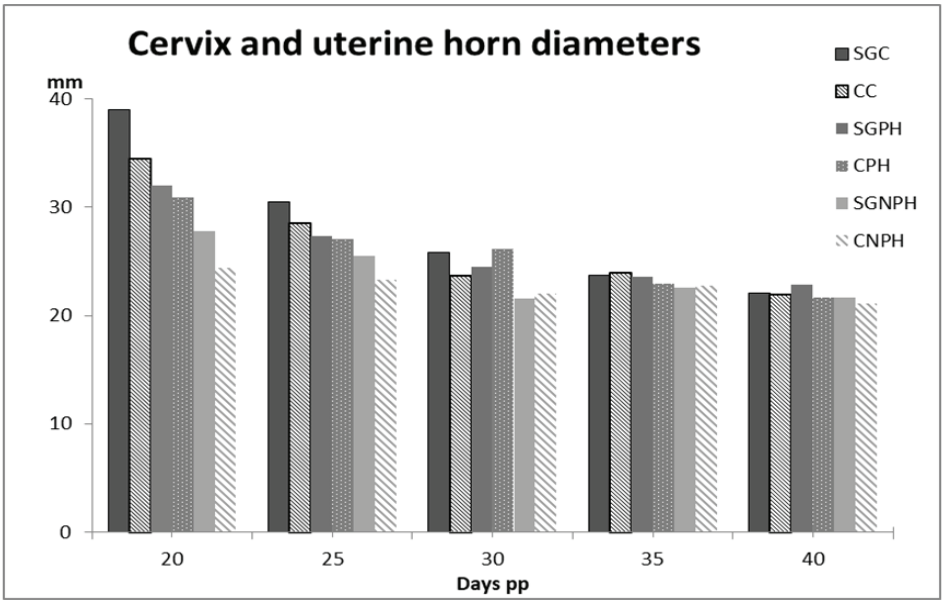

Figure 4. Average diameters of the cervix, previously pregnant uterine horn and previously non-pregnant uterine horn on examination days (SGC: study group mean cervix diameter, CC: Control group mean cervix diameter, SGPH: study group previously pregnant uterine horn mean diameter, CPH: Control group previously pregnant uterine horn mean diameter, SGNPH: study group previously nonpregnant uterine horn mean diameter, CPH: Control group previously nonpregnant uterine horn mean diameter)

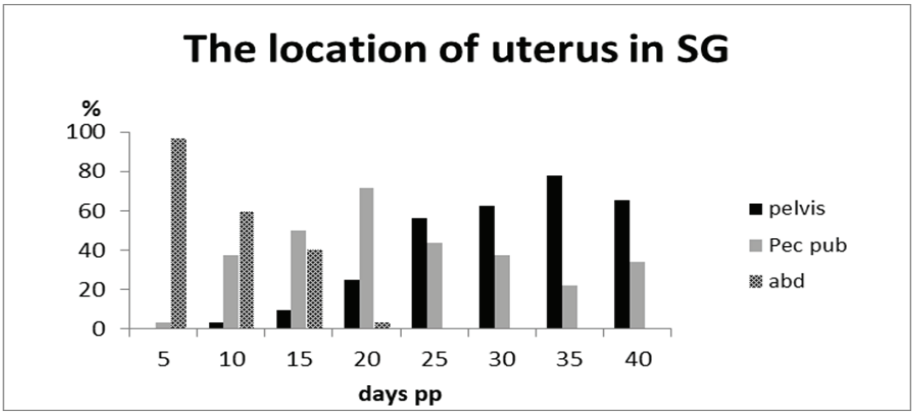

Figure 5. Proportional location of uterus of SG on the days of examination at rectal palpation (pelvis: pelvic cavity, pec pub: pecten pubis, abd: abdomen)

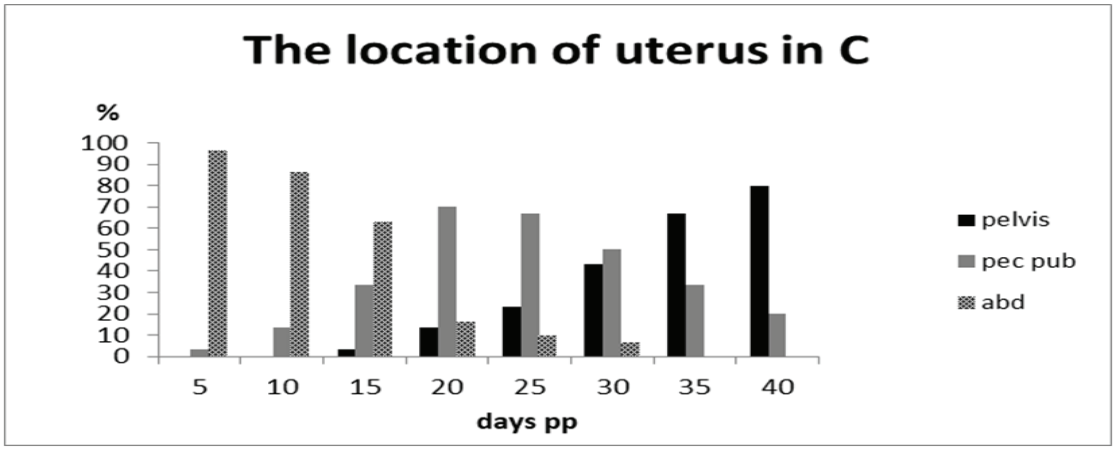

Figure 6. Proportional location of uterus C on the days of examination at rectal palpation (pelvis: pelvic cavity, pec pub: pecten pubis, abd: abdomen)

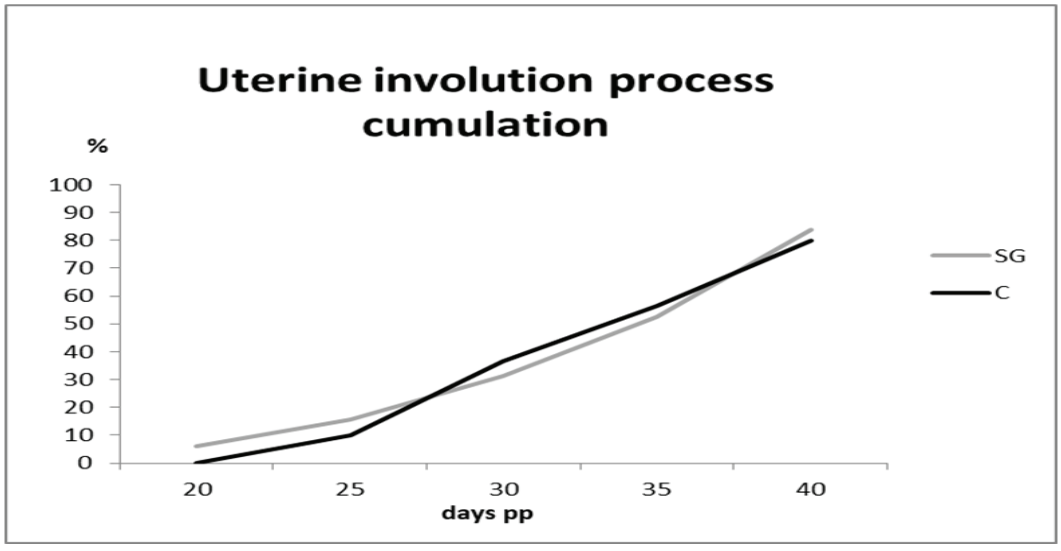

Figure 7. Completion rates of uterine involution by examination days in SG and C

Table 1. Fertility parameters in SG and C

	Up to pp 80 days		Up to pp 150 days		Up to pp 400 days	
*	SG	C	SG	C	SG	C
FIPR	%33,33	%37,50	%42,10[a]	%41,17[a]	%43,47[d]	%40,00[d]
SIPR	%0,0	%0,0	%50,00[b]	%50,00[b]	%38,46[e]	%46,66[e]
TIPR	%0,0	%0,0	%0,0	%50,00	%50,00[f]	%57,14[f]
II	3,00	2,66	2,27[c]	2,27[c]	2,31[g]	2,23[g]

*FIPR: pregnancy rate afterfirstartificialinsemination, SIPR: pregnancy rate aftersecondartificialinsemination, TIPR: pregnancy rate in thirdartificialinsemination, II: artificialinseminationindex. (There is no difference between the values indicated by the same letter in the same line.)

(3/7) of C cows that experienced placental retention. The rate of clinical endometritis was 34.37% (11/32) in SG and 46.66% (14/30) in C. There was no statistically significant difference (P>0.05) in puerperal metritis, spontaneous recovery after puerperal metritis, clinical endometritis after puerperal metritis, involuntary culling after puerperal metritis, puerperal metritis after *retentio secundinarum* and clinical endometritis rates between the groups.

No bacterial growth was found in most of the mi-

crobiological samples taken during the estrus period in the groups (90.00% SG and 83.35% C). *T. pyogenes* was isolated from 3.3% of the SG cows and 6.6% of the C cows. *Klebsiella spp*. (6.6%) was identified only from SG cows. *Staphylococcus spp*. (3.33%) and *Streptococcus spp*. (6.6%) were isolated only from C cows. The evaluated fertility parameters after artificial insemination (Table 1) were not statistically significant in SG and C (P>0.05).

DISCUSSION

Cows expel the placenta 6-24 hours after parturition (Swiefy, 2003). The critical time interval for placental retention has been reported to be 12-24 hours postpartum, and most cows expel the placenta within 12 hours (Beagley et al., 2010). In this study, placenta expelled in approximately 65% of both groups within the first 12 hours postpartum (64% of SG, 65.71% of C). It has been reported that placental retention in cows occurs at a rate of 7.2% (McLaren et al., 2006), but can vary between 1.3% and 39.2% (Qu et al., 2014). Han and Kim (2005) reported that the rate of placental retention was 8.3-28.1%, assuming that the critical time for placenta expulsion is the 24th hour after parturition. In this study, the critical time for expulsion of the placenta was 24 hours pp. Placental retention developed in 11.76% of SG cows and 20.00% of C cows (P>0.05). Although the results align with the literature, they can be regarded as high in both groups on a herd basis. Putro (1988) reported that administration of intrauterine 500 ml 2% Lugol's solution immediately after parturition reduces the incidence of placental retention. However, this study found no evidence that povidone-iodine accelerates placental excretion more than isotonic saline. It was thought that the type or volume of antiseptic used may cause different results. Povidone-iodine and isotonic saline treatment may also be considered to have the identical effect. It has previously been stated that intrauterine isotonic saline treatment affects some inflammatory processes in mares (Brinsko et al., 2011). Intrauterine saline lavage in cows also significantly reduces the intrauterine leukocyte rate in subclinical endometritis (Dini et al., 2015). In this study, the control group was administered 100 ml of isotonic saline solution, which was thought to be too low for the uterus after birth. It is thought that the potential of low-volume saline solution to have similar effects to intrauterine lavage should be clarified in future studies.

Healthy freshen cows have an average rectal body temperature of 38.9 °C for the first days postpartum (Kristula et al., 2001). During postpartum metritis, body temperature is in the range of 39.2-39.5 °C (Smith et al., 1998; Drillich et al., 2001). On the other hand, body temperature may not rise in 28.6-58.5% of cows with metritis (Benzaquen et al., 2007; Palenik et al., 2009). Additionally, the body temperature of 14-66% of healthy cows in a herd can rise above 39.5 °C at least once during the first ten days of puerperium (Wenz et al., 2011; Suthar et al., 2012). Body temperature exceeded 39.5 °C for at least one day in both groups (32.35% of SG and 34.28% of C). However, 63.64% of SG cows and 41.67% of C cows with malodorous vaginal discharge had high body temperature. In fact, despite puerperal metritis cases, 14.28% of cows had hypothermia (<37.0 °C) in study cows. Using high body temperature as a single diagnostic sign for postpartum uterine infections may be misleading in this context. Regarding the study's primary objective, it was determined that early postpartum 2% povidone-iodine infusion had no significant impact on body temperature. Even though both groups' body temperatures were lower than previously reported, the difference in the groups' mean body temperatures in this study (Figure 1) was not statistically significant (P>0.05).

The variable color of lochia during the first few weeks of puerperium can be considered part of the healthy involution process as long as it is odorless (LeBlanc et al., 2002a; LeBlanc et al., 2002b; Sheldon et al., 2006). This study classified odorless bloody or purulent/mucopurulent discharge as typical lochia. There was no statistical difference in vaginal discharge odor scores among groups (P>0.05). Nevertheless, malodorous discharge of C cows ceased at day 25 pp. However, it was still detectable in SG even at d40 (Fig. 3). In healthy mares, intrauterine infusion of 1% povidone-iodine caused considerable increases in inflammatory cells in the endometrium, although the inflammatory response subsequently transitioned from acute to chronic (Olsen et al., 1992). It is possible to assume that persistent malodorous discharge in SG was due to the negative effect of povidone-iodine on the innate uterine immunity after local infusion. Further precise studies, such as investigating intrauterine phagocyte ratios, are needed to indicate the potential in vivo effect of povidone-iodine administered to healthy cows in the early postpartum period.

The uterine horn diameter of a healthy cow should be approximately 2-4 cm within 25-30 days after parturition (Sheldon et al. 2004). According to LeBlanc et

al. (2002b), horn diameters thicker than 8 cm on days 20-33 postpartum can be utilized to diagnose clinical endometritis. Comparison of the diameters of the previously gravid and non-gravid uterine horns has also been stated as a method for evaluating the involution process. Saut et al. (2011) revealed that the diameter difference between previously gravid and non-gravid uterine horns lowered to 1 mm by postpartum day 21. Earlier research found a minimal difference in horn diameters, at least on day 28 postpartum (Okano and Tomizula, 1987). Contrary to previous reports in this study PH and NPH diameters were observed to equalize at a later time in the involution process in both SG and C (on the 35th day pp) (Figure 4). It is possible to consider that uterine involution was delayed in both groups. However, it can also be caused by individual variations such as breed, age, and parity of the cows. Further studies are needed in more homogeneous herds with negative control groups that will not receive intrauterine administration.

Involution of the cervix is completed much later than that of the uterus. However, in a healthy involution process, it is stated that the cervical diameter of the cow should be less than 5 cm on the postpartum 40th day (Sheldon, 2004). Several studies have obtained variable cervical diameters on different days of the postpartum involution process (LeBlanc et al., 2002b; Kasimanickam et al., 2004; Lopez-Helguera et al., 2012). The diameter of the cervix in this study (Figure 5) was 23.6-67 mm (average 39 mm) in SG and 21.2-63 mm (average 35 mm) in C at d20. The cervical diameters of six of the C cows and five of the SG cows were greater than 50 mm on d20. At d25, the cervixes of three cows in C and two cows in SG were thicker than 50 mm. It was subsequently observed that the cervical diameters were below 35 mm on d30 in both groups. Eventually, the mean cervical diameter difference between SG and C at d35 was less than 1 mm. There was no statistically significant difference in mean cervical diameter between the groups during the examination days ($P>0.05$). It was thought that intrauterine povidone-iodine administration in the early postpartum period did not have a different accelerating effect than isotonic saline administration on the cervical involution process.

Studies using rectal examination to follow the involution process report various results regarding the region where the uterus can be palpated. According to Saut et al. (2011), the entire uterus was palpable in the pelvic cavity in 58% of the cows in the second week of puerperium and in 100% of them in the fourth week of puerperium. Conversely, Gonzalez Sanchez et al. (1999) reported that the entire uterus can be palpated in the abdominal cavity in 95% of postpartum cows, in 91.8% in the second week and in 17.2% in the sixth week. In this study, considering the *os pelvis* and *pecten pubis* as the pelvic cavity, the uterus was palpated in the pelvic cavity in 60% of SG cows on d15 and in 100% on d25 (Figure 5). However, the uterus was palpated in the pelvic cavity later in C than in SG (83% on d20 and 100% on d35, Figure 6). Iodinated antiseptics have a naturally irritating effect (Carleton et al., 2008) that might hasten the involution process. This irritant effect may have caused earlier onset of uterine involution in SG. However, interpretation of uterine involution based on the location of the palpable uterus can be misleading. For instance, when the involution process was assessed by rectal palpation, it was possible to conclude that it was completed in all study cows. However, when examined by ultrasound imaging it was revealed that the uterine involution process was not yet completed. Uterine involution is frequently completed on 29-35 days postpartum. However, in more than 50% of the cows in a herd, it might be extended up to 42 days (Zain et al., 1995). Kaewlamun et al. (2011) state that high-yield dairy cows'uterine involution should be completed within 30 to 40 days. According to the uterine horn diameters, the day when uterine involution started to be completed was d20 in SG and d25 in C. Uterine involution was not yet complete at d40 in 20% of C cows and 17% of SG cows. There was no statistically significant difference in the rate of completion of uterine involution between SG and C ($P>0.05$). It was concluded that a low volume of %2 povidone-iodine infusion in early postpartum appears to have had a role in the uterine involution process.

Uterine infections may occur at a rate of 10-80% in cows (Gilbert et al., 2005; Földi et al., 2006; Palenik et al., 2009; Dubuc et al., 2011). Puerperal metritis is reported to be 18.5-21% (Drillich et al., 2001; Benzaquen et al., 2007), and endometritis is reported to be 2.2-37.3% (LeBlanc et al., 2002b). In this study, puerperal metritis was found to be 32% in SG and 20% in C, while clinical endometritis was found to be 46.66% and 34.37% in SG and C respectively. Moreover, clinical endometritis was observed in 50% of the cows suffering from puerperal metritis in SG and in 71.42% in C. Although the small sample sizes of the groups in terms of postpartum uterine infection occurrence remains a limitation of this study, the rate of uterine

infections was consistent with previous reports in both groups. According to Setyawan et al. (2021), intrauterine %1 povidone-iodine infusion in beef cattle in the first postpartum week can minimize bacterial infection until the fifth week. However, in this study, there was no significant difference (P>0.05) between the groups. Moreover, uterine bacterial species were similar between groups. In this context, early postpartum intrauterine povidone-iodine infusion seems to have failed to prevent uterine infections.

The incidence of metritis following placental retention has been reported to be 25-50% (LeBlanc, 2008), and with one report showing this rate to be up to 90% (Montes and Pugh, 1993). In this study, 100% of SG cows and 42.85% of C cows developed puerperal metritis after placental retention. While the placental retention rate was higher in C, puerperal metritis following placental retention was higher in SG. Metritis development following placental retention was also higher in SG than in earlier studies (LeBlanc, 2008; Montes and Pugh, 1993). It is reported that following intrauterine treatment with iodine-rich Lugol's solution, epithelial regeneration begins within 10 hours and is completed within 3-4 days (Yamamoto et al. 1996). More devastating results have been reported in in-vitro studies. Povidone-iodine has been found to have cytotoxic effects on osteoblast, fibroblast, and myoblast cells in in-vitro experiments (Liu et al., 2017). Povidone-iodine has also been found to have cytotoxic effects that reduce the viability of endometrial epithelial cells and inhibit wound healing (Thongrueang et al., 2022). The greater rate of metritis development in SG may have occurred due to impaired local immunity or temporary degeneration of the uterine epithelium following intrauterine povidone-iodine infusion. In contrast, the rate in C, while not as high as in SG, can be regarded as high based on previous reports. Further, in vivo investigations were needed to demonstrate the acute effects of intrauterine administration of povidone-iodine and isotonic saline.

Notable spontaneous recovery of endometritis occurs on day 28 postpartum (LeBlanc et al., 2002a), though the process might take up to 60 days (Gautam et al., 2009). On the other hand, according to Gautam et al. (2010), endometritis does not recover spontaneously, and the infection becomes persistent at a rate of 25.3%. In this study, significant purulent/mucopurulent discharge ratio was observed in SG on d25 (63.33%) and in C on d15 (52%). Ratios decreased to 30% in both groups on d40. Contrary to the claim of LeBlanc et al. (2002a), spontaneous recovery did not occur suddenly and was observed over time. It would be inaccurate to conclude whether one of two local therapies affects the healing of endometritis due to the absence of a negative control group in this study. However, since there was no statistically significant difference in spontaneous recovery rates between the groups (P>0.05), povidone-iodine administration appears to have an identical effect as an isotonic saline solution on the spontaneous recovery process.

Administration of intrauterine povidone-iodine in endometritis cases has a beneficial effect on fertility (Mido et al., 2016). However, there is no consensus on the results of ionized antiseptic infusion in the early postpartum period. It has been reported that povidone-iodine has no significant effect on reproductive parameters after manual intervention of placental retention compared to systemic prostaglandin injection (Polat et al., 2009). It was previously reported that intrauterine povidone-iodine administration after placental retention impaired fertility parameters compared to antibiotics (Geiser et al., 1995). According to an older study, intrauterine Lugol's solution treatment on the third postpartum day had no effect on the incidence of metritis or the involution process (Neuhardt et al., 1983). On the other hand, Ahmed and Elsheikh (2013) observed that intrauterine administration of 2% povidone-iodine to cows at risk of significant postpartum contamination enhances fertility. The difference in fertility parameters evaluated between C and SG in this study was not statistically significant (P> 0.05). It was concluded that intrauterine 2% povidone-iodine infusion within 24 hours of puerperium did not have a more beneficial effect on reproductive parameters than the isotonic saline solution (Table 1).

CONCLUSION

The results of this study indicate that administration of 2% povidone-iodine solution in a 100 ml volume to healthy cows within 24 hours of parturition has no impact on intrauterine microbial load, involution process, placental retention, involution process fails such as clinical endometritis and puerperal metritis. Moreover, it does not affect fertility. Conversely, it has no negative consequences than isotonic saline solution. Regular intrauterine povidone-iodine administration in the early postpartum period appears to have resulted inadditional labor and charge.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest

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