Journal of Obstetrics, Gynecology and Cancer Research | ISSN: 2476-5848

Thrombo-Prophylactic Effects of Low Molecular Weight Heparin in Women Without Thrombophilic Disorder Undergoing Assisted Reproductive Technology: A Double-Blind, Randomized, Placebo-Controlled Clinical Trial

Mohammad Ebrahim Parsa Nezhad, Elnaz Fathi Fathikaljahi, Sareh Dousfatemeh*

Department of Obstetrics and Gynecology, School of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran

Article Info

10.30699/jogcr.9.1.63

Received: 2023/06/05;
Accepted: 2023/12/14;
Published Online: 22 Jan 2024;

Use your device to scan and read the article online

Corresponding Information:
Sareh Dousfatemeh,
Department of Obstetrics and Gynecology, School of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran

Email: sare_doustfateme@yahoo.com

ABSTRACT

Background & Objective: In this placebo-controlled randomized clinical trial, we aimed to investigate the effect of low molecular weight heparin (LMWH) on the assisted reproductive technology (ART) success rate in women without thrombophilic disorder undergoing assisted reproductive technology.

Materials & Methods: The study population consisted of 276 patients referred to the infertility center at Shiraz University of Medical Sciences and who underwent in vitro fertilization (IVF) for the first time. Patients were randomly assigned into two groups (control group = 137 women who underwent IVF and received placebo; case group = 139 women who underwent IVF and received LMWH). The case group was treated with LMWH and the control group received placebo. Specifications for egg harvesting, processing sperm, the number of fertilized eggs and embryos, the number of frozen and transferred embryos, and the IVF outcome were assessed.

Results: The mean age of subjects was 32.59 ± 4.41 years old in the case group and 32.62 ± 5.18 in the control group (p = 0.955). The final outcome of IVF treatment in the control group was treatment failure (62%), clinical pregnancy (21.2%), chemical pregnancy (5.9%), and live birth (7.3%), while in the case group, it was treatment failure (48.2 %), clinical pregnancy (21.6%), chemical pregnancy (2.2%), and live births (28.1%). There was a significant difference in IVF outcome in the two groups (P < 0.001).

Conclusion: Given the significant difference in the number of live births and reduction of pregnancy complications in the LMWH group, it can be concluded that LMWH prophylaxis may be effective in ART success.

Keywords: Assisted Reproductive Technology, In vitro Fertilization, Low Molecular Weight Heparin, Clinical Trial

Introduction

Infertility is defined as a couple's infertility after one year of sexual intercourse without the use of preventive methods, and 14% of couples all over the world suffer from this problem. Usually, 85-90% of healthy young couples will get pregnant within one year. However, 10-15% of couples remained infertile among them, 15% have received infertility treatments **(1, 2)**. In Iran, the prevalence of infertility is reported at 10.9% and the most common cause is female factor (3).

In vitro fertilization (IVF) technique, as a method of assisted reproductive therapy (ART), plays a very important role in the whole world, which has become one of the pillars of infertility treatment **(4)**. Despite the immense success of IVF treatment in many patients, failure could happen in multiple cycles of implantation, and live birth statistics are disappointing using the ART method **(5)**. The process of implantation is one of the most important and sensitive steps of the ART cycle, which requires a healthy embryo and prepared endometrium, with embryo implantation taking place based on these two factors' interactions **(5-7)**. Abnormal embryos, endometrium, and female factors lead to implantation failure. Previous studies have tried to suggest an applicable treatment for this failure, including aspirin, vaginal sildenafil, low molecular weight heparin (LMWH), and intravenous immune globulin (IVIG) **(5, 6)**.

In fact, the process of implantation is a complex phenomenon in which autocrine and paracrine regulator systems play an important role. It has been hypothesized that heparin can adjust the mentioned factors and improve embryo penetration into the endometrium and thereby increase success **(8, 9)**.

It has been shown that heparin could have an immunomodulatory effect in addition to its anticoagulant effect **(10)**. Adhesion molecules such as

growth factors like heparin-binding epidermal growth factor, E-cadherin, and the free insulin-like growth factor have a significant effect on endometrial epithelial cells, blastocyst connection, and trophoblast invasion into the endometrium. Heparin can improve trophoblast invasion into endometrium by reducing E-cadherin and also improve implantation by increasing these two growth factors **(11-13)**.

In fact, the main effect of heparin is its anticoagulant effect, which improves blood supply to the placenta. Besides the mentioned effect, heparin can be combined with several proteins and improve the implantation process and trophoblast growth **(14, 15)**.

Several studies have attempted to find a way to increase ART success. One of these methods is to use LMWH in ART cycles. Despite the proposed hypothesis based on improving implantation by heparin with the mentioned mechanisms and the common use of LMWH in ART cycles, previous studies have failed to definitely reveal a meaningful difference in the success rate of ART cycles between patients who received LMWH and the control group **(16, 17)**. Therefore, the goal of this study was to see how LMWH affected the success rate of ART cycles when compared to a control group.

Methods

Trial design and population

This placebo-controlled, randomized clinical trial included a total of 276 patients (20-40-year-old women) who were referred to Ghadir Mother and Child Hospital and a private clinic for infertility diseases affiliated with Shiraz University Medical Sciences, who underwent IVF for the first time.

Inclusion criteria were as follows: all patients under 40 years of age underwent IVF for the first time and all of their laboratory tests such as antithrombin, protein C and S, homocysteine, lupus anticoagulant, and anti-cardiolipin antibodies were within the normal range. Moreover, patients with chronic diseases, uterine or fallopian tube abnormalities (hydrosalpinges visible on transvaginal ultrasonography and fibroids larger than 5 cm), and those who had received LMWH in the past three months were excluded from the study.

Using a computer-based algorithm that followed a random number generator technique, patients were randomly divided into two groups with a 1:1 aspect ratio to receive either LMWH or placebo. In the control group, 137 patients were enrolled to receive placebo, and 139 patients were treated with LMWH in the case group. The participants were categorized using an online calculator at www.calculator.net, and each patient was allocated a number at random depending on the calculator's output. Numbers one to 139 were in the intervention group, whereas numbers 140 to 276 were in the control group. In addition, both groups had the same age distribution.

Trial procedures

All patients received a long-term gonadotropin-releasing hormone (GnRH) method in order to induce ovulation. HCG was administered for oocyte maturation when at least three follicles greater than 17 mm were observed on ultrasound. Oocyte retrieval was performed after 36 hours. The standard technique of IVF was conducted, and the embryo transfer was done after the egg and sperm combination on an appropriate day. On the day of oocyte retrieval, patients were allocated into two groups at random. In the control group, normal saline was administered subcutaneously after oocyte retrieval, and the case group received LMWH with 40 mg/ml daily. On day 14, after embryo transfer, a pregnancy test was performed in both groups. If the pregnancy test was positive, treatment with LMWH or subcutaneous saline placebo was continued until the 9th week of gestation. All patients were followed until delivery. In fact, sperm was taken from four men using the Testicular sperm extraction (TESE) method, while sperm from the other men was taken in the usual way (normal ejaculation).

Trial outcomes

All the information such as etiology, follicular puncturing (including the number of oocytes and oocyte scoring), sperm processing (including the number, motility, and morphology), ART procedure (the number of fertilized oocytes and embryos), embryo transfer, freezing, and final outcome were collected in a checklist.

Statistical analysis

A Statistical Package for the Social Sciences (SPSS) version 21 was used to conduct the analysis (IBM. Corporation, Armonk, NY, USA). Descriptive and continuous variables are presented in terms of numbers (percentages) and mean ± standard deviation (SD). To determine the factors influencing the outcome of IVF, independent sample T-test and chi-square tests were used. The significant level was considered to be $P < 0.05$.

Trial oversight

The present study was approved by the Shiraz University of Medical Sciences' institutional review board and received the approval of the Ethical Committee (IR.SUMU.MSP.MED.1394.26). It's worth noting that all the study's subjects signed written informed consents.

Results

Patients

The mean age of subjects and their partners was 32.61 ± 4.79 years (20-40 years) and 36.38 ± 5.8 years (24-61 years), respectively. In this study, 276 patients were evaluated. The patients' demographic data and causes of infertility of two groups are displayed in

Table 1. There was no statistical difference between the case and control groups in terms of the mean age or the number of causes of infertility.

Table 1. Distribution of infertility causes in study population

	Control group Frequency (percent)	Case group Frequency (percent)	P value
Age	32.62 ± 5.18	32.59 ± 4.41	0.955
Partner age	32.28 ± 2.27	36.74 ± 5.65	0.781
The cause of infertility			
Tubal abnormality	13 (9.5%)	17 (12.2%)	
Male factor	11 (8%)	20 (14.4%)	
Ovulation problems	10 (7.3%)	15 (10.8%)	0.91
Endometrioma	7 (5.1%)	12 (8.6%)	
unknown	96 (70.1%)	75 (54%)	

Comparison of oocyte and sperm characteristics in the fertilization process in the study population and controls are available in (Table 2).

Table 2. Comparison of oocyte and sperm characteristics in the fertilization process in the study population and controls.

Title	Control group (mean ± SD)	Case group (mean ± SD)	P-value
Oocyte number	12.22 ± 8.08	12.32 ± 8.34	0.922
M2-oocyte number	10.47 ± 7.55	10.64 ± 7.4	0.845
Number of sperm before preparation process	66.23 ± 60.25	64.09 ± 54.94	0.763
Number of sperm after preparation process	30.19 ± 21.02	28.29 ± 19.72	0.499
Sperm with normal morphology percentage before preparation process	10.5 ± 8.62	28.29 ± 19.72	0.521
Sperm with normal morphology percentage after preparation process	20.89 ± 14.85	20.22 ± 14.67	0.743
Sperm with normal motility percentage before preparation process	40.75 ± 25.28	41.24 ± 25.54	0.876
Sperm with normal motility percentage after preparation process	91.72 ± 19.26	92.55 ± 15.68	0.730
Number of fertilized oocyte	8.36 ± 6.14	8.82 ± 6.76	0.599
Number of embryos	7.86 ± 6.09	8.3 ± 6.37	0.563
Number of frozen embryos	7.88 ± 6.37	8.45 ± 6.22	0.527
Number of fertilized cycles	2.77 ± 1.78	2.79 ± 1.57	0.923

As (Table 2) shows, there was no significant difference between the two groups regarding the mentioned values. Moreover, although all four men in whom sperm extraction was done by the TESE method, were in the control group, there was not a significant difference in terms of sperm extraction between the two groups (P = 0.123).

A comparison of the number of transferred embryos as well as the final outcome distributed in the two groups was compared and shown in (Table 3).

Table 3. Comparing the number of embryos transferred and final IVF outcomes in control and intervention groups.

Variable	Control group	Case group	P-value
The number of transferred embryos			
1 embryo	6 (4/4%)	14 (10.1%)	0.208
2 embryos	95 (69.9%)	83 (60.1%)	
3 embryos	33 (24.3%)	38 (27.5%)	
Final IVF outcome			
Chemical pregnancy	13 (9.5%)	3 (2.2%)	< 0.001
Clinical pregnancy	29 (21.2%)	30 (21.6%)	
Live births	10 (7.3%)	39 (28.1%)	
Abortion	42 (30.7%)	33 (23.7%)	
Treatment failure	85 (62%)	67 (48.2%)	

According to chi-square test results, there was a significant difference in IVF final outcome in the two groups (P < 0.001), and the number of pregnancies and live births were more in the case group (Table 3). Complications such as IUGR, preeclampsia, oligohydramnios, and abruption were significantly fewer in the case group than in the control group (Figure 1).

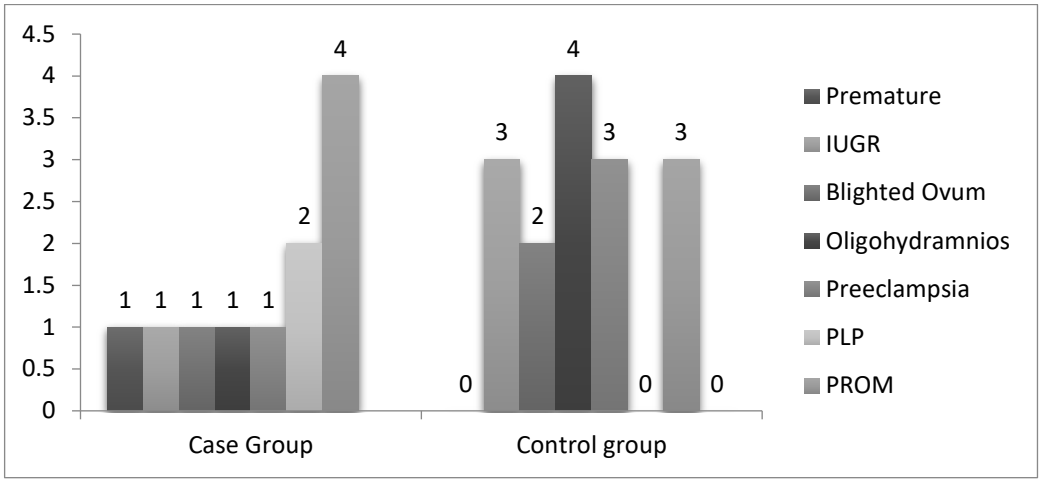

Figure 1. Distribution of abortion causes and pregnancy complications in the case and control group

Discussion

Nowadays, the process of treatment in patients with recurrent pregnancy failure associated with antiphospholipid antibodies syndrome or other thrombophilic disorders is focused on using anti-thrombotic drugs **(18)**, leading to efforts on new dimensions of treatment and even using this method in patients with recurrent abortion, not because of thrombophilia, is recommended **(19)**. Despite proposing a hypothesis that implantation will be improved by heparin and the common use of LMWH in ART cycles, previous studies have failed to show a remarkable difference in the success rate of ART cycles in those who received LMWH compared to their control group **(18-20)**. In the present study, final outcomes such as clinical pregnancy and live births were found to be more while abortion and treatment failure were less in the LMWH group than controls. Moreover, the case group had a greater rate of IUGR, preeclampsia, oligohydramnios, and PROM as pregnancy complications than the control group.

As in the Safdarian, Kheirollahi **(21)** study which compared the results of patients with immunological, thrombophilia, or disorders of unknown cause who were treated with heparin **(21)**. Although the difference was not significant, patients with immunological causes or thrombophilia who were treated with heparin had more positive HCG tests than patients in the unknown cause group (58.3% vs. 27.8%). They stated that due to the lack of a significant difference in the outcome of pregnancy in patients with frequent IVF failure receiving heparin between the two groups, it

does not seem that heparin treatment in patients with frequent IVF failure would be beneficial. Although the difference was not significant, the positive pregnancy outcome in women with thrombophilia or immunological causes treated with heparin was higher, but to provide a therapeutic solution, larger randomized studies evaluating the effect of heparin in patients with recurrent implantation failure are necessary. In the current study, the case group's final IVF treatment outcome was 48.2 percent vs. 62 percent, clinical pregnancy 21.6 percent vs. 21.2 percent, chemical pregnancy 2.2 percent vs. 9.5 percent, and live birth 28.1 percent vs. 7.3 percent, all of which were significantly better than the controls ($p < 0.001$).

Qublan, Amarin **(22)** found that patients who got LMWH as a thromboprophylaxis had significantly higher implantation and pregnancy rates than those who received a placebo (20.9% vs. 6.1%, $P < 0.001$ and 31% vs. 9.6%, $P < 0.05$, respectively). In the heparin group, the rate of live births was likewise significantly higher than in the control group (23.8% vs 2.8%). They discovered that the abortion rate in the placebo group was considerably greater than in the heparin group ($P < 0.05$). In line with the mentioned study, in a RCT by S Singh, Cheluvaraju and Jain **(23)**, they showed that in women with a previous history of infertility, LMWH would be effective in the luteal phases of fresh IVF cycles, while Yang, Chen **(17)** in a meta-analysis refuted the effect of LMWH on pregnancy success rate in non-thrombophilic women having IVF. Likely, other studies could not show the beneficial effects of LMWH in the luteal phase on IVF/intracytoplasmic sperm injection (ICSI) cycles in women with recurrent implementation failure **(24, 25)**.

In the Qublan, Amarin **(22)** study, LMWH was only given to patients who had thrombophilia, whereas in our study, heparin was given to all patients who underwent IVF for the first time and did not have a thrombophilia problem. It is noteworthy that receiving heparin by all patients may cause a problem that may be in the absence of heparin, the IVF treatment was also successful. In fact, heparin was able to increase the number of live births. Since the most common cause of infertility in both groups was not known, heparin was also able to help the patients with the unknown causes.

In a similar study, Potdar, Gelbaya **(26)** systematically assessed the effect of LMWH as a supplementary medication in IVF treatment on the live birth rate and implantation rate in women who had previously failed IVF. Based on the results, the pooled risk ratio in women with three or more previous failed IVF ($n = 245$) showed a significant increase in the number of live births ($P = 0.002$, RR = 1.79, 95% CI 1.10-2.90) and a decrease in the abortion rate ($P = 0.02$, RR = 0.22, 95% CI 0.06-0.78) in the LMWH treated group compared to controls. Also, adjuvant treatment with LMWH improved the live birth rate significantly in women who had three or more recurrent IVF failures (79% compared to the control group). However, they stressed that the mentioned treatment should be considered with caution because the total number of participants was low. More evidence from clinical trials in more powerful and more qualified centers is required before recommending clinical use of LMWH.

In the present study, the mean pregnancy weeks of abortion were 18 weeks in the control group and 13 weeks in the case group. It seems that giving heparin not only increases the number of live births, but also makes it take longer for a miscarriage to happen in the LMWH group than in the control group. At the same time, live births in the case group were at 38 weeks and in the control group they happened at 36 weeks, so it might be concluded that in the control group due to pregnancy complications, pregnancy termination has occurred in lower weeks and the case group has experienced a lower risk pregnancy. The prevalence of pregnancy complications such as IUGR, oligohydramnios, and preeclampsia was also more common in the control group than in the case group. Therefore, future studies can look at how heparin affects the rate of pregnancy complications during the study period as well as the success of IVF treatment.

Conclusion

Based on the results in our study and the considerable difference in the number of live births in the heparin group and the reduction in pregnancy complications, LMWH prophylaxis seems to be effective in ART cycles' success. If similar results are found in future studies with larger sample sizes, LMWH could be used as an extra treatment for people going through IVF for the first time.

Acknowledgments

The present article was extracted from the thesis written by Elnaz Fathi Kaljahi and was financially supported by Shiraz University of Medical Sciences, Shiraz, Iran. (Grant No. 6550s).

Conflict of Interest

The authors declare no conflict of interest.

Funding

This study was funded by Shiraz University of Medical Sciences.

Author's contributions

All authors were involved in designing the study, data gathering and analysis, and writing the manuscript. They all read the final manuscript and approved it, and they all took the responsibility.

References

1. Wilkes S, Chinn DJ, Murdoch A, Rubin G. Epidemiology and management of infertility: a population-based study in UK primary care. Fam Pract. 2009;26(4):269-74. [PMID] [DOI:10.1093/fampra/cmp039] [DOI:10.1093/fampra/cmp029]
2. Winarto H. Precision medicine: Leading medical research to change life results. J Nat Sci Biol Med. 2019;10(3):1.
3. Parsanezhad ME, Jahromi BN, Zare N, Keramati P, Khalili A, Parsa-Nezhad M. Epidemiology and etiology of infertility in Iran, systematic review and meta-analysis. J Womens Health. 2013;6(2). [DOI:10.4172/2325-9795.1000121]
4. Baroroh HN, Nugroho AE, Lukitaningsih E, Nurrochmad A. Immune-enhancing effect of bengkoang (Pachyrhizus erosus (L.) Urban) fiber fractions on mouse peritoneal macrophages, lymphocytes, and cytokines. J Nat Sci Biol Med. 2021;12(1):84. [DOI:10.4103/jnsbm.JNSBM_53_20]
5. Berker B, Taşkın S, Kahraman K, Taşkın EA, Atabekoğlu C, Sönmezer M. The role of low-molecular-weight heparin in recurrent implantation failure: a prospective, quasi-randomized, controlled study. Fertil Steril. 2011; 95(8):2499-502. [DOI:10.1016/j.fertnstert.2010.12.033] [PMID]
6. Bohlmann MK. Effects and effectiveness of heparin in assisted reproduction. J Reprod Immunol. 2011;90(1):82-90. [DOI:10.1016/j.jri.2011.03.004] [PMID]
7. Fatemi H, Popovic-Todorovic B. Implantation in assisted reproduction: a look at endometrial receptivity. Reprod Biomed Online. 2013;27(5): 530-8.[DOI:10.1016/j.rbmo.2013.05.018][PMID]
8. Noci I, Milanini MN, Ruggiero M, Papini F, Fuzzi B, Artini PG. Effect of dalteparin sodium administration on IVF outcome in non-thrombophilic young women: a pilot study. Reprod Biomed Online. 2011;22(6):615-20. [DOI:10.1016/j.rbmo.2011.03.016] [PMID]
9. Patil HV, Patil VC. Comparative study of procalcitonin and C-reactive protein in patients with sepsis. J Nat Sci Biol Med. 2020;11(2):93. [DOI:10.4103/jnsbm.JNSBM_159_19]
10. Li X, Ma X. The role of heparin in sepsis: much more than just an anticoagulant. Br J Haematol. 2017;179(3):389-98. [DOI:10.1111/bjh.14885] [PMID]
11. Seshadri S, Sunkara S, Khalaf Y, El-Toukhy T, Hamoda H. Effect of heparin on the outcome of IVF treatment: a systematic review and meta-analysis. Reprod Biomed Online. 2012;25(6):572-84. [DOI:10.1016/j.rbmo.2012.08.007] [PMID]
12. Rokade A, Kshirsagar N, Laddad M. PAP Smear versus Colposcopy in Symptomatic Women and Women with Suspicious-Looking Cervix. J Nat Sci Biol Med. 2021;12(2):145. [DOI:10.4103/jnsbm.JNSBM_145_20]
13. Nasser NA, Baban RS, Al-Habib MF, Jameel RAA. The association between urinary placental protein 13 and soluble fms-like tyrosine kinase-1 in preeclamptic women in the third trimester of pregnancy. Baghdad j Biochem Appl Biol Sci. 2020;1(01):46-51. [DOI:10.47419/bjbabs.v1i01.31] [DOI:10.47419/bjbabs.v1i01.30]
14. Nelson SM, Greer IA. The potential role of heparin in assisted conception. Hum Reprod Update. 2008; 14(6):623-45. [DOI:10.1093/humupd/dmn031] [PMID]
15. Nasser NA, Baban RS, Al-Habib MF, Jameel RAA. Serum placental growth factor (PLGF) and soluble fms-like tyrosine kinase-1 (sFLT-1) in preeclamptic women at their third trimester of pregnancy. Baghdad j Biochem Appl Biol Sci. 2020;1(01):39-45. [DOI:10.47419/bjbabs.v1i01.31] [DOI:10.47419/bjbabs.v1i01.30]
16. Siristatidis C, Dafopoulos K, Salamalekis G, Galazios G, Christoforidis N, Moustakarias T, et al. Administration of low-molecular-weight heparin in patients with two or more unsuccessful IVF/ICSI cycles: a multicenter cohort study. Gynecol Endocrinol. 2018;34(9):747-51. [DOI:10.1080/09513590.2018.1442426] [PMID]
17. Yang X-L, Chen F, Yang X-Y, Du G-H, Xu Y. Low molecular weight heparin does not reduce miscarriages in non-thrombophilic IVF/ICSI-treated women. Acta Obstet Gynecol Scand. 2019; 98(1):131-2. [DOI:10.1111/aogs.13483] [PMID]
18. Skeith L, Carrier M, Kaaja R, Martinelli I, Petroff D, Schleußner E, et al. A meta-analysis of low-molecular-weight heparin to prevent pregnancy loss in women with inherited thrombophilia. Blood. 2016;127(13):1650-5. [DOI:10.1182/blood-2015-12-626739] [PMID]
19. Simcox LE, Ormesher L, Tower C, Greer IA. Thrombophilia and pregnancy complications. Int J Mol Sci. 2015;16(12):28418-28. [DOI:10.3390/ijms161226104] [PMID] [PMCID]
20. Allahbadia GN. Low-molecular-weight heparin (lmwh) in women with repeated implantation failure. Springer; 2012. [PMID] [PMCID] [DOI:10.1007/s13224-012-0308-8]

21. Safdarian L, Kheirollahi E, Alyasin A, Hossinei MA, Saeidi H. Therapeutic Effects of Heparin on Repeated Implantation Failures in IVF Cycles; A Randomized Clinical Trial. J Reprod Infertil. 2008;9(3):246-55.

22. Qublan H, Amarin Z, Dabbas M, Farraj A-E, Beni-Merei Z, Al-Akash H, et al. Low-molecular-weight heparin in the treatment of recurrent IVF-ET failure and thrombophilia: a prospective randomized placebo-controlled trial. Hum Fertil. 2008;11(4):246-53. [DOI:10.1080/14647270801995431] [PMID]

23. Singh N, Cheluvaraju R, Jain SK. A prospective randomized controlled trial showing efficacy of luteal phase low molecular weight heparin in fresh non-donor IVF/ICSI cycles in women with previous implantation failures. Int j Reprod Contracept Obstet Gynecol. 2019;8(11):4163-9. [DOI:10.18203/2320-1770.ijrcog20194839]

24. Awwad J, El Taha L, Ghunaim SS, Khalife D, Choucair F, Hamdar L, Ghazeeri GS. The Administration Of Luteal Phase Low Molecular Weight Heparin To Improve Live Births After Recurrent Implantation Failure: A Prospective Randomized Clinical Trial. Fertil Steril. 2021; 116(3):e39. [DOI:10.1016/j.fertnstert.2021.07.115]

25. Jasirwan SO, Iffanolida PA, Santawi VPA, Friska D, Wiweko B. Relationship between morphology of tripronuclear embryo and chromosomal abnormalities potential in intracytoplasmic sperm injection cycles. J Nat Sci Biol Med. 2019;10(3): 92.

26. Potdar N, Gelbaya TA, Konje JC, Nardo LG. Adjunct low-molecular-weight heparin to improve live birth rate after recurrent implantation failure: a systematic review and meta-analysis. Hum Reprod Update. 2013;19(6):674-84. [DOI:10.1093/humupd/dmt032] [PMID]

How to Cite This Article:

Parsa Nejad, M. E., Fathi Kaljahi, E., Dousfatemeh, S. Thrombo-Prophylactic Effects of Low Molecular Weight Heparin in Women Without Thrombophilic Disorder Undergoing Assisted Reproductive Technology: A Double-Blind, Randomized, Placebo-Controlled Clinical Trial. J Obstet Gynecol Cancer Res. 2024;9(1):63-9.

Download citation: RIS | EndNote | Mendeley |BibTeX |