

| 5.1. UTERİN ATONİ TANIMI

Uterin atoni, doğum sonrası plasentanın ayrılmasını takiben, plasental implantasyon alanındaki damarlardan oluşan kanamayı durdurmaya yetecek düzeyde, yeterli uterin kontraksiyonların oluşmamasıdır (1).

Postpartum kanama (PPK), tüm doğumların %1 ila %5'inde ortaya çıkan ciddi bir obstetrik acildir ve anne ölümlerinin dünya genelinde en sık görülen obstetrik nedenlerinden biri olmaya devam etmektedir (2-5) Uterin atoni, postpartum kanamaların %70 ila %80'inden tek başına sorumlu olan en yaygın etiyolojik faktördür (2, 6). Şiddetli veya tedaviye dirençli postpartum kanaması olan vakaların %41,4'ünden ve peripartum histerektomilerin ise %27'sinden sorumlu olduğu gösterilmiştir (7, 8).

| 5.2. UTERİN ATONİNİN PATOFİZYOLOJİSİ

Postpartum kanama ve atoni patofizyolojisini anlayabilmek için doğum sonrası hemostaz mekanizmalarının anlaşılması gerekir. Normal gebeliklerde termde intervillöz aralıkta fizyolojik olarak 500 ila 700 mL/dk kan akımı bulunur ve bu akım kardiyak debinin yaklaşık %15'ini oluşturur (9). Normal durumlarda, plasental ayrılma sonrası hemostaz iki ana mekanizmanın birleşimiyle gerçekleşir:

- » **Mekanik hemostaz:** Doğum sonrası, plasentanın ayrıldığı bölgedeki spiral arterlerden kaynaklanan kanamayı durdurmak için miyometrium kasılarak

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KAYNAKLAR

1. Cunningham FG, Leveno KJ, Bloom SL. Williams Obstetrics. 26th ed. ed. New York, NY: McGraw-Hill Education; 2022.
 2. Practice Bulletin No. 183: Postpartum Hemorrhage. Obstetrics and gynecology. 2017;130(4):e168-e86.
 3. Sheldon WR, Blum J, Vogel JP, Souza JP, Gülmezoglu AM, Winikoff B. Postpartum haemorrhage management, risks, and maternal outcomes: findings from the World Health Organization Multicountry Survey on Maternal and Newborn Health. BJOG : an international journal of obstetrics and gynaecology. 2014;121 Suppl 1:5-13.
 4. Li S, Gao J, Liu J, Hu J, Chen X, He J, et al. Incidence and Risk Factors of Postpartum Hemorrhage in China: A Multicenter Retrospective Study. Frontiers in medicine. 2021;8:673500.
 5. Corbetta-Rastelli CM, Friedman AM, Sobhani NC, Arditì B, Goffman D, Wen T. Postpartum Hemorrhage Trends and Outcomes in the United States, 2000-2019. Obstetrics and gynecology. 2023;141(1):152-61.
 6. Bateman BT, Berman MF, Riley LE, Leffert LR. The epidemiology of postpartum hemorrhage in a large, nationwide sample of deliveries. Anesthesia and analgesia. 2010;110(5):1368-73.
 7. Yunus I, Islam MA, Sindhu KN, Devall AJ, Podsek M, Alam SS, et al. Causes of and risk factors for postpartum haemorrhage: a systematic review and meta-analysis. Lancet (London, England). 2025;405(10488):1468-80.
 8. van den Akker T, Brobbel C, Dekkers OM, Bloemenkamp KWM. Prevalence, Indications, Risk Indicators, and Outcomes of Emergency Peripartum Hysterectomy Worldwide: A Systematic Review and Meta-analysis. Obstetrics and gynecology. 2016;128(6):1281-94.
 9. Walls R, Hockberger R, Gausche-Hill M, Erickson TB, Wilcox SR. Rosen's Emergency Medicine-Concepts and Clinical Practice E-Book: 2-Volume Set: Elsevier Health Sciences; 2022.
 10. Gill P, Patel A, Van Hook JW. Uterine Atony. StatPearls. Treasure Island (FL) ineligible companies. Disclosure: Anjali Patel declares no relevant financial relationships with ineligible companies. Disclosure: James Van Hook declares no relevant financial relationships with ineligible companies.: StatPearls Publishing
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11. Yi C, Li K, Shi Q. Meta-analysis of the effect of duration of labour on postpartum haemorrhage. Ginekologia polska. 2024;95(5):391-7.
 12. Rubio Álvarez A, Hernández Martínez A, Molina Alarcón M. [Factors associated with blood loss during precipitate labor]. Anales del sistema sanitario de Navarra. 2017;40(2):237-45.
 13. Magalhaes JK, Carvalho JC, Parkes RK, Kingdom J, Li Y, Balki M. Oxytocin pretreatment decreases oxytocin-induced myometrial contractions in pregnant rats in a concentration-dependent but not time-dependent manner. Reproductive sciences (Thousand Oaks, Calif). 2009;16(5):501-8.
 14. Khireddine I, Le Ray C, Dupont C, Rudigoz RC, Bouvier-Colle MH, Deneux-Tharaux C. Induction of labor and risk of postpartum hemorrhage in low risk parturients. PloS one. 2013;8(1):e54858.
 15. Kelly AJ, Kavanagh J, Thomas J. Vaginal prostaglandin (PGE2 and PGF2a) for induction of labour at term. The Cochrane database of systematic reviews. 2003(4):Cd003101.
 16. Chang CC, Wang IT, Chen YH, Lin HC. Anesthetic management as a risk factor for postpartum hemorrhage after cesarean deliveries. American journal of obstetrics and gynecology. 2011;205(5):462.e1-7.
 17. Gallo DM, Romero R, Bosco M, Chaiworapongsa T, Gomez-Lopez N, Arenas-Hernandez M, et al. Maternal plasma cytokines and the subsequent risk of uterine atony and postpartum hemorrhage. Journal of perinatal medicine. 2023;51(2):219-32.

18. Anderson JM, Etches D. Prevention and management of postpartum hemorrhage. *American family physician*. 2007;75(6):875-82.
19. FIGO. Uterine atony and uterotonics in postpartum haemorrhage (FIGO Statement). September 2023.
20. Guidelines for oxytocin administration after birth: AWHONN practice brief number 2. *Nursing for women's health*. 2015;19(1):99-101.
21. Evensen A, Anderson JM, Fontaine P. Postpartum Hemorrhage: Prevention and Treatment. *American family physician*. 2017;95(7):442-9.
22. World Health Organization. WHO recommendations for the prevention and treatment of postpartum haemorrhage. Geneva: 2012.
23. Begley CM, Gyte GM, Devane D, McGuire W, Weeks A. Active versus expectant management for women in the third stage of labour. *The Cochrane database of systematic reviews*. 2011(11):Cd007412.
24. Gallos I, Devall A, Martin J, Middleton L, Beeson L, Galadanci H, et al. Randomized Trial of Early Detection and Treatment of Postpartum Hemorrhage. 2023;389(1):11-21.
25. Gallos ID, Papadopolou A, Man R, Athanasopoulos N, Tobias A, Price MJ, et al. Uterotonic agents for preventing postpartum haemorrhage: a network meta-analysis. *The Cochrane database of systematic reviews*. 2018;12(12):Cd011689.
26. Escobar MF, Nassar AH, Theron G, Barnea ER, Nicholson W, Ramasauskaite D, et al. FIGO recommendations on the management of postpartum hemorrhage 2022. *International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics*. 2022;157 Suppl 1(Suppl 1):3-50.
27. World Health Organization. WHO recommendations for the prevention and treatment of postpartum haemorrhage. Geneva: 2021.
28. T.C. Sağlık Bakanlığı. Doğum Sonu Bakım Yönetim Rehberi. Ankara, Türkiye: 2020.
29. Likis FE, Sathe NA, Morgans AK, Hartmann KE, Young JL, Carlson-Bremer D, et al. AHRQ Comparative Effectiveness Reviews. Management of Postpartum Hemorrhage. Rockville (MD): Agency for Healthcare Research and Quality (US); 2015.
30. Patacchiola F, D'Alfonso A, Di Fonso A, Di Febbo G, Kaliakoudas D, Carta G. Intrauterine balloon tamponade as management of postpartum haemorrhage and prevention of haemorrhage related to low-lying placenta. *Clin Exp Obstet Gynecol*. 2012;39(4):498-9.
31. C BL, Coker A, Lawal AH, Abu J, Cowen MJ. The B-Lynch surgical technique for the control of massive postpartum haemorrhage: an alternative to hysterectomy? Five cases reported. *British journal of obstetrics and gynaecology*. 1997;104(3):372-5.
32. Panda B, Laifer S, Stiller R, Kleinman G. Primary atony of the lower uterine segment as a distinct cause of early postpartum haemorrhage: a case series and management recommendations. *Journal of obstetrics and gynaecology : the journal of the Institute of Obstetrics and Gynaecology*. 2009;29(7):628-32.
33. Main EK, Goffman D, Scavone BM, Low LK, Bingham D, Fontaine PL, et al. National Partnership for Maternal Safety: Consensus Bundle on Obstetric Hemorrhage. *Obstetrics and gynecology*. 2015;126(1):155-62.
34. Dilla AJ, Waters JH, Yazer MH. Clinical validation of risk stratification criteria for peripartum hemorrhage. *Obstetrics and gynecology*. 2013;122(1):120-6.
35. Kramer MS, Berg C, Abenhaim H, Dahhou M, Rouleau J, Mehrabadi A, et al. Incidence, risk factors, and temporal trends in severe postpartum hemorrhage. *American journal of obstetrics and gynecology*. 2013;209(5):449.e1-7.
36. Ende HB, Lozada MJ, Chestnut DH, Osmundson SS, Walden RL, Shotwell MS, et al. Risk Factors for Atonic Postpartum Hemorrhage: A Systematic Review and Meta-analysis. *Obstetrics and gynecology*. 2021;137(2):305-23.

37. Brynolf A, Sandström A. Risk of recurrent red-cell transfusion in delivery: A nationwide longitudinal study. 2024;131(4):455-62.
38. Westergaard D, Steinhorsdottir V. Genome-wide association meta-analysis identifies five loci associated with postpartum hemorrhage. 2024;56(8):1597-603.
39. Cianci V, Mondello C, Sapienza D, Genazzani AD, Tornese L, Cianci A, et al. Uterine atony and postpartum haemorrhage: predisposing genetic factors and postmortem findings. *La Clinica terapeutica*. 2025;176(4):468-77.
40. Edhi MM, Aslam HM, Naqvi Z, Hashmi H. "Post partum hemorrhage: causes and management". *BMC research notes*. 2013;6:236.
41. Nyflot LT, Sandven I, Stray-Pedersen B, Pettersen S, Al-Zirqi I, Rosenberg M, et al. Risk factors for severe postpartum hemorrhage: a case-control study. *BMC pregnancy and childbirth*. 2017;17(1):17.
42. Smith J, Johnson A. Parity with Risk and Increased Incidence of Postpartum Hemorrhage. *Journal of Medical Health Science*. 2022;15(3):45-52.
43. Zackler A, Flood P, Dajao R, Maramara L, Goetzl L. Suspected Chorioamnionitis and Myometrial Contractility: Mechanisms for Increased Risk of Cesarean Delivery and Postpartum Hemorrhage. 2019;26(2):178-83.
44. Lodato RF, Khan AR, Zembowicz MJ, Weisbrodt NW, Pressley TA, Li YF, et al. Roles of IL-1 and TNF in the decreased ileal muscle contractility induced by lipopolysaccharide. *The American journal of physiology*. 1999;276(6):G1356-62.
45. Rauk PN, Friebe-Hoffmann U. Interleukin-1 beta down-regulates the oxytocin receptor in cultured uterine smooth muscle cells. *American journal of reproductive immunology (New York, NY : 1989)*. 2000;43(2):85-91.
46. Rauk PN, Chiao JP. Oxytocin signaling in human myometrium is impaired by prolonged exposure to interleukin-1. *Biology of reproduction*. 2000;63(3):846-50.
47. Jena BH, Biks GA, Gete YK, Gelaye KA. Determinants of postpartum uterine atony in urban South Ethiopia: a community-based unmatched nested case-control study. *BMC pregnancy and childbirth*. 2023;23(1):499.
48. Robinson C, Schumann R, Zhang P, Young RC. Oxytocin-induced desensitization of the oxytocin receptor. *American journal of obstetrics and gynecology*. 2003;188(2):497-502.
49. Belghiti J, Kayem G, Dupont C, Rudigoz RC, Bouvier-Colle MH, Deneux-Tharaux C. Oxytocin during labour and risk of severe postpartum haemorrhage: a population-based, cohort-nested case-control study. *BMJ open*. 2011;1(2):e000514.
50. Grotegut CA, Paglia MJ, Johnson LN, Thames B, James AH. Oxytocin exposure during labor among women with postpartum hemorrhage secondary to uterine atony. *American journal of obstetrics and gynecology*. 2011;204(1):56.e1-6.
51. Lam SJ, Best S, Kumar S. The impact of fibroid characteristics on pregnancy outcome. *American journal of obstetrics and gynecology*. 2014;211(4):395.e1-5.
52. Shavell VI, Thakur M, Sawant A, Kruger ML, Jones TB, Singh M, et al. Adverse obstetric outcomes associated with sonographically identified large uterine fibroids. *Fertility and sterility*. 2012;97(1):107-10.
53. Karsli B, Kaya T, Cetin A. Effects of intravenous anesthetic agents on pregnant myometrium. *Polish journal of pharmacology*. 1999;51(6):505-10.
54. Thind AS, Turner RJ. In vitro effects of propofol on gravid human myometrium. *Anaesthesia and intensive care*. 2008;36(6):802-6.
55. Gultekin H, Yildiz K, Sezer Z, Dogru K. Comparing the relaxing effects of desflurane and sevoflurane on oxytocin-induced contractions of isolated myometrium in both pregnant and nonpregnant rats. *Advances in therapy*. 2006;23(1):39-46.
56. Yoo KY, Lee JC, Yoon MH, Shin MH, Kim SJ, Kim YH, et al. The effects of volatile anest-

- hetics on spontaneous contractility of isolated human pregnant uterine muscle: a comparison among sevoflurane, desflurane, isoflurane, and halothane. *Anesthesia and analgesia*. 2006;103(2):443-7, table of contents.
57. Berlet T, Krah A, Börner U, Gathof BS. Desflurane inhibits platelet function in vitro similar to halothane. *European journal of anaesthesiology*. 2003;20(11):878-83.
58. Hirakata H, Ushikubi F, Toda H, Nakamura K, Sai S, Urabe N, et al. Sevoflurane inhibits human platelet aggregation and thromboxane A2 formation, possibly by suppression of cyclooxygenase activity. *Anesthesiology*. 1996;85(6):1447-53.
59. Fauza DO, Kohane DS, Beeuwkes EB, Clayton N, Maher TJ. Local anesthetics inhibit uterine activity in vitro. Possible application on preterm labor prevention and treatment. *Fetal diagnosis and therapy*. 2003;18(5):292-6.
60. Lo B, Hönemann CW, Kohrs R, Hollmann MW, Polanowska-Grabowska RK, Gear AR, et al. Local anesthetic actions on thromboxane-induced platelet aggregation. *Anesthesia and analgesia*. 2001;93(5):1240-5.
61. Wendel MP, Shnaekel KL, Magann EF. Uterine Inversion: A Review of a Life-Threatening Obstetrical Emergency. *Obstetrical & gynecological survey*. 2018;73(7):411-7.