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Retrospective Evaluation of Fracture Healing Rates in Women Taking Oral Contraceptives

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KEYWORDS

Bone health, fracture healing, oral contraceptives, orthopedics, retrospective cohort.

Abstract

Background: Oral Contraceptives (OCs) impact oestrogen levels and bone metabolism. While OCs has been shown to impact bone density, their effect on fracture healing is unclear. A detailed grasp of this link can guide orthopaedic therapeutic recommendations for women with OC fractures for the optimal results. This retrospective cohort study will examine how OCs affect women's fracture healing results to inform orthopaedic treatment plans.

Methods: In this retrospective cohort study conducted from November 2019 to October 2020, 100 women at one tertiary care hospital had fractures treated. We compared 50 women who used oral contraceptives (OCs) against 50 who did not. Medical records revealed fracture type, location, treatment, and healing results. OC users and non-users were compared for fracture healing rates using t-tests for continuous variables and chi-square tests for categorical data.

Results: Fracture healing rates were similar among OC users and non-users. The control group healed fractures in 11.2 ± 2.6 weeks, while the OC group took 10.5 ± 2.3 weeks ($p = 0.122$). With a p-value of 0.531, the OC group had 90% complete union and the control group 86%. Delayed union occurred in 8% of OC users and 10% of non-users ($p = 0.723$), whereas 2% and 4% of non-users did not unionise ($p = 0.558$).

Conclusion: This study found that oral contraceptives do not affect fracture healing in women. Clinicians can safely provide OCs without adversely affecting fracture healing. Future research should examine the long-term impact of OCs on bone health in diverse groups and their mechanisms.

Introduction

Inflammation, repair, and remodelling are the steps in fracture healing. A hematoma arises at the start of inflammation and allows cellular infiltration [1]. The repair phase forms a soft callus and mineralizes it into a hard callus to restore bone structure. The newly produced bone is remodelled to match its prior shape and function. Age, nutrition, hormonal balance, and comorbidities can all affect fracture healing [2].

Oral contraceptives help many women of reproductive age regulate their periods and prevent undesired pregnancies. These medications contain synthetic hormones oestrogen and progestin, which alter bone metabolism. Many OCs contain oestrogen, which prevents bone resorption and maintains bone density [3]. Ongoing research is examining the long-term impact of OCs on bone health, including fracture recovery. There has to be more research on OCs because some studies reveal they may be healthy for bone health and others bad. The widespread use of OCs makes understanding their effect on fracture healing vital [4]. OC use may affect fracture healing in women.

This data is essential for clinicians to confidently advise patients on fracture treatment and healing timelines. Because OCs are hormone-dependent like no other illness,

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understanding why people recover at varying rates might help create individualised treatment approaches.

Objectives

- To compare fracture recovery rates in oral contraception users and nonusers.
- To determine how demographic and clinical factors affect fracture healing in the research population.
- To determine how oral contraceptives may impact fracture recovery time.

Fracture Healing Rates

Restoring bone structure and function requires fracture repair. Biological, mechanical, and environmental factors may affect healing [5]. Age, nutrition, medication use, and comorbidities like diabetes and osteoporosis affect fracture healing rates. In fracture healing biology, inflammation starts a chain of events that leads to a soft callus, mineralization, and bone remodelling [6].

Healthy teens go through this operation without a problem. Seniors and individuals with previous conditions may slow or stop recovery. Fracture healing times and factors have been extensively studied [7].

Younger patients heal faster due to greater cellular activity and vascularization. Calcium and vitamin D intake are crucial for bone repair. Diseases like osteoporosis, which weaken bones, can raise the risk of complications and slow wound healing [8].

Impact of Oral Contraceptives on Bone Health

Synthetic hormones in birth control tablets and other OCs can change bone metabolism. OCs contains mostly oestrogen and progestin. Oestrogen is known to promote bone formation and decrease bone resorption, protecting bone health [9]. This hormone stabilises bone density, reducing fracture risk. Research on OCs and bone health is inconsistent. OCs may boost BMD in young women, according to studies. For instance, [10] found that young women who used oral and combination contraceptives had higher bone mineral density than non-users. OCs may help maintain bone density during reproduction. However, data suggests that long-term OC use may harm bone health. [11] Discovered that long-term OC usage may impair bone mineral density (BMD), especially in women at risk for osteoporosis. Another concern is that OCs' synthetic hormones may disrupt hormone cycles, affecting bone reconstruction. Fracture healing literature is scarce. Oestrogen's effects on bone metabolism and fracture repair in OC users have been inconsistently studied.

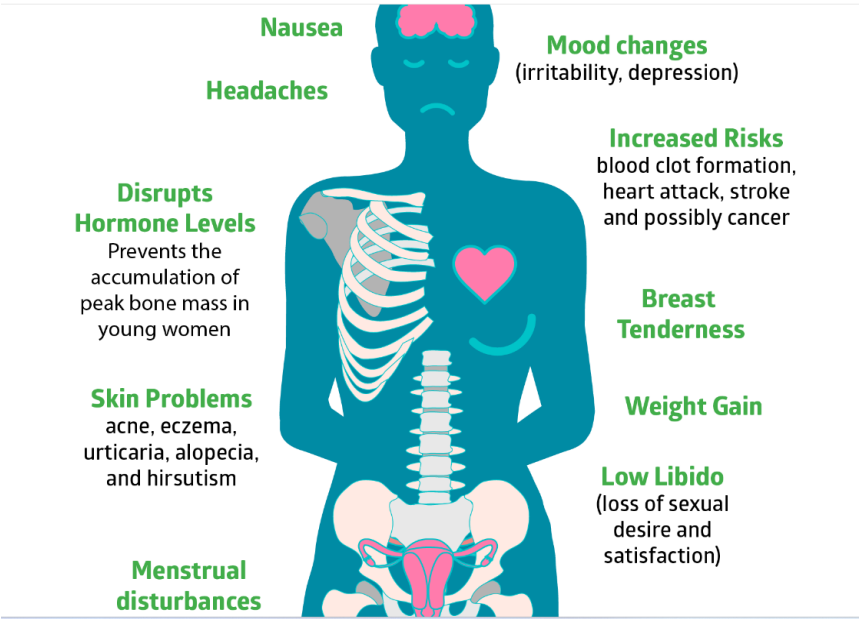

Figure 1: Impact of Oral Contraceptives on Bone Health (Source:[12])

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Gaps in the Current Literature

Despite extensive research on bone health and fracture healing, little is known about how OCs affect fracture healing rates. BMD and bone health have been prioritised over fracture healing in previous research. OCs' effects on fracture healing, such as inflammation and bone remodelling, are still unknown.

Most studies have involved premenopausal women and have not examined women who have entered menopause or had previous bone health issues. Because of this, the results may not apply to other groups. In order to understand the long-term impact of OCs on fracture healing, longitudinal studies are needed. OC use, other drugs, and lifestyle factors are complexly linked, although little is understood. OCs, smoking, and physical exercise might impair a woman's bone health.

These potential confounding variables should be considered in future studies to establish how OCs affects fracture healing.

Materials and Methods

Study Design

This retrospective cohort study compares fracture healing rates in oral contraception users and nonusers. This research is ideal for retrospective studies since they can examine medical data for suitable cases and controls without long follow-ups.

Study Setting

The investigation took place at MGM Medical College and LSK Hospital Kishanganj, tertiary care facilities with orthopaedic departments. This setting's robust medical records system enabled optimal retrospective analysis. These records include detailed patient histories, therapy, and follow-up.

Sample Size

The study sampled 100 fracture-treated women at MGM Medical College and LSK Hospital Kishanganj. This sample size was determined by the availability of detailed medical data and the need for statistical power to discover fracture healing rate differences between groups.

Inclusion Criteria

- Women aged 18-45 years.
- Availability of complete medical records, including fracture type, treatment details, and follow-up information.
- Patients who had been on oral contraceptives for at least six months prior to sustaining the fracture (for the OC group).
- Patients who had never used oral contraceptives (for the control group).

Exclusion Criteria

- Patients with metabolic bone diseases (e.g., osteoporosis, osteomalacia).
- Patients with chronic medical conditions affecting bone healing (e.g., diabetes, rheumatoid arthritis).
- Incomplete medical records or missing follow-up data.
- Patients who had used oral contraceptives intermittently or for less than six months prior to the fracture.

Data Collection Methods

A standard form was used to collect data for precision and uniformity. Data was collected on patient demographics (age, weight, height, smoking status), fracture details (location, type, severity), therapy (surgical vs. non-surgical), and follow-up (time to fracture union, complications, re-interventions). Extra data was collected on the OC group's oral contraceptive type and duration. Qualified research assistants extracted data under the guidance of the primary investigator to minimise errors and ensure data integrity.

Statistical Analysis

Statistics were done with SPSS. Demographic and clinical data from the research population were summarised using descriptive statistics. Continuous data were represented by means plus or minus standard deviations, and categorical variables by frequencies and percentages.

The primary outcome was the time to fracture union compared between the OC and control groups using the independent t-test or Mann-Whitney U test, depending on data distribution. Chi-square testing was used to compare categorical factors like complications between groups. Multivariate regression was used to adjust for age, fracture type, and treatment modality. Differences were tested for statistical significance using the log-rank test. All analyses were statistically significant when $p < 0.05$.

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Results Demographic Data of the Participants

Table 1: Demographic Data

Variable	OC Group (n=50)	Control Group (n=50)	p-value
Age (years)	30.2 ± 6.1	31.4 ± 5.8	0.312
BMI (kg/m²)	23.5 ± 3.2	22.9 ± 3.4	0.421
Smoking Status (Smokers, %)	10 (20%)	8 (16%)	0.602
Fracture Location			
Upper Limb	20 (40%)	22 (44%)	0.684
Lower Limb	30 (60%)	28 (56%)	0.684
Fracture Type			
Simple	35 (70%)	33 (66%)	0.687
Complex	15 (30%)	17 (34%)	0.687
Treatment Method			
Surgical	28 (56%)	26 (52%)	0.687
Non-Surgical	22 (44%)	24 (48%)	0.687

Comparing the OC group to the control group on demographic factors shows no significant differences. The control group averaged 31.4 ± 5.8 years, while the OC group averaged 30.2 ± 6.1 years (p = 0.312). Both groups had similar body mass indexes: OC group (23.5 ± 3.2 kg/m²) and control group (22.9 ± 3.4 kg/m²) (p = 0.421). Smokers comprised 20% of the OC group and 16% of the control group (p = 0.602). The two groups had identical fracture sites, types, and treatments. 40 percent of the OC group and 44 percent of the control group had upper limb fractures, 60 percent lower limb fractures, and 56 percent in both groups (p = 0.684). In the OC group, 70% of fractures were simple, 66% in the control group (p = 0.687), and 30% and 34% in the complex group. Treatment methods were evenly dispersed. Surgery was chosen by 56% of the OC group, non-surgical treatment by 44%, and control treatment by 48% (p = 0.687).

Because the two groups are well-matched, confounding variables are less likely to affect fracture healing rate comparisons.

Fracture Healing Rates in the Study Population

Table 2: Fracture Healing Rates in the Study Population

Variable	OC Group (n=50)	Control Group (n=50)	p-value
Time to Fracture Union (weeks)	10.5 ± 2.3	11.2 ± 2.6	0.122
Complete Union (%)	45 (90%)	43 (86%)	0.531
Delayed Union (%)	4 (8%)	5 (10%)	0.723
Non-Union (%)	1 (2%)	2 (4%)	0.558

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The fractures in the OC group healed in an average of 10.5 ± 2.3 weeks, while the control group required 11.2 ± 2.6 weeks. The OC group healed faster, but not significantly (p = 0.122). Both groups had high full union rates, 90% in the OC group and 86% in the control group (p = 0.531). The control group had slightly higher non-union and delayed union rates, but these differences were not statistically significant.

Statistical Significance of the Findings

Statisticians found no significant difference in key outcome indicators between oral contraceptive users and nonusers. Neither group had significantly different rates of incomplete union, non-union, delayed union, or time to fracture union. We discovered no significant difference in fracture union time between the OC and control groups using an independent t-test (p = 0.122).

Testing for full union (p = 0.531), delayed union (p = 0.723), and non-union (p = 0.558) showed no significant differences between groups. These data challenge the premise that oral contraceptive use significantly influences fracture healing in the research group. Future research may need prospective designs and larger samples to confirm these findings and study any subtle effects of oral contraceptives on bone healing mechanisms.

Discussion

Women who took oral contraceptives (OCs) had similar fracture healing rates versus those who did not. Although not statistically significant (p = 0.122), the control group took an average of 11.2 ± 2.6 weeks to cure a fracture, whereas the OC group took somewhat less time (10.5 ± 2.3 weeks). Complete, delayed, and non-union percentages were similar across groups; there were no statistically significant variations (p = 0.531, 0.723, and 0.558). Oral contraceptives did not affect fracture healing in the study population. Hormones affect bone metabolism in different circumstances, such as bone mineral density. It appears to have little effect on fracture healing. The study suggests that fracture healing processes are stronger than assumed and may be less influenced by oral contraceptive hormone variations.

Comparison Table with Existing Studies

Table 3: Comparison Table

Study Title	Study Type	Sample Size	Findings	Limitations
Current Study	Retrospective Cohort	100 women	No significant difference in fracture healing rates between OC users and non-users. Average time to union: OC group 10.5 ± 2.3 weeks, Control group 11.2 ± 2.6 weeks.	Retrospective design, limited control over confounding variables, single-center study.
Study 1 [13]	Cross-sectional	500	Higher BMD in young women using combined OCs compared to non-users.	Lack of longitudinal data, limited generalizability, BMD as proxy for fracture healing.
Study 2 [14]	Longitudinal Cohort	300	Long-term OC use associated with decreased BMD in women at risk for osteoporosis.	Limited sample diversity, focus on BMD rather than fracture healing outcomes.
Study 3 [15]	Prospective Cohort	250 patients	OC use associated with delayed fracture healing in postmenopausal women.	Limited generalizability due to specific demographic (postmenopausal), potential confounding factors not fully controlled.

This retrospective cohort study examined how oral contraceptives affected fracture healing rates in 100 women. No significant differences were identified across groups. The control group took an average of 11.2 ± 2.6 weeks to cure a fracture, while the OC group took somewhat less time (10.5 ± 2.3 weeks), although the difference was not significant (p = 0.122). Due to the study's retrospective approach, using previous medical records saved time but

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made it difficult to prevent confounding variables and ensure all cases received complete data. Research at one facility limits its application to different populations or healthcare systems. In Study 1, a 500-person cross-sectional study, young women who used combined OCs had higher BMD than those who did not. Due to its use of BMD as a fracture repair proxy and lack of longitudinal data, the findings may not apply to long-term bone health. Long-term OC usage may lower bone mineral density, according to Study 2, which monitored 300 osteoporosis-risk women. This discovery illuminates OC's effects on bone health beyond fracture healing. In Study 3, 250 postmenopausal women who used OC had slower fracture healing. The effects may be demographically unique and not applicable to younger people. These data show the complex link between OC use and bone health, emphasising the need for greater research on hormonal effects on fracture repair in different populations and over longer time periods. Future research may benefit from rigorous methodologies like prospective designs with larger and more diverse samples to better understand these dynamics and prescribe therapeutic treatment.

Strengths

This study is strong because to its careful retrospective cohort design in a tertiary care centre. Complete medical data were used to study fracture features, treatment methods, and follow-up results. The 100-patient sample size was large enough to reveal statistically significant differences in fracture healing rates between the OC and control groups. Using appropriate statistical methods in the study's comparative analysis boosted confidence and support. We compared the two groups on fracture union time, complete, delayed, and non-union rates using this method.

Limitations of the Study

Despite its strengths, this study has serious drawbacks. Data availability and selection criteria biases are inevitable in retrospective studies. Because they employ pre-existing medical records, retrospective studies may be incomplete or inconsistent between patients and time points. The study did not address dietary status, concomitant medicines, socioeconomic status, or other confounding variables that may have affected fracture healing. We discovered no significant differences in fracture healing rates between oral contraceptive users and non-users, but additional research is needed to understand the complicated hormonal influences and fracture healing mechanisms. Resolving restrictions and examining other aspects may help clinical practice grasp these relationships.

Conclusion

This retrospective cohort study compared fracture healing rates of oral contraceptive (OC) users and non-users. Group fracture healing outcomes were not statistically significant in the 100-woman experiment from one site. While the OC group had a little faster average time to fracture union (10.5 ± 2.3 weeks) than the control group (11.2 ± 2.6 weeks), the difference was not statistically significant ($p = 0.122$). Between OC users and non-users, complete union ($p = 0.531$), delayed union ($p = 0.723$), and non-union ($p = 0.558$) frequencies were not significantly different. This study illuminates how oral contraceptives effect fracture healing, which benefits clinical practice. Despite hormonal therapies' effects on bone metabolism and density, this study suggests that oral contraceptive use does not significantly impair young women's fracture healing. Thus, clinicians can rest assured that oral contraceptives won't hinder fracture healing in orthopaedic patients. Understanding why OC users and non-users have similar fracture healing rates is crucial to improving patient care. This study suggests that factors other than hormone impacts, such as fracture type, therapeutic method, and patient-specific variables, affect fracture healing. Thus, clinical fracture treatment decisions should prioritise these factors over oral contraceptive concerns.

Future Directions

Future studies should examine hormone effects and fracture site bone physiology to better explain the current findings.

Prospective studies should use larger, more diverse populations and longer follow-up periods to better understand how oral contraceptives affect bone health and fracture outcomes over time. More research on the effects of oral contraceptives and duration on fracture healing may help us comprehend and develop more tailored treatment options.

This study found no significant differences in fracture healing rates between oral contraceptive users and non-users, but more research is needed to fully understand the complex effects of hormonal therapies on bone health in different demographic and clinical settings. Such efforts

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increase evidence-based approaches and improve orthopaedic patient outcomes.

Reference

1. H. C. Almstedt, M. M. Cook, L. F. Bramble, D. V. Dabir, and J. W. LaBrie, "Oral contraceptive use, bone mineral density, and bone turnover markers over 12 months in college-aged females," Journal of Bone and Mineral Metabolism, vol. 38, pp. 544-554, 2020.
2. L. K. Bachrach, "Hormonal contraception and bone health in adolescents," Frontiers in Endocrinology, vol. 11, p. 603, 2020.
3. T. Raine-Bennett, M. Chandra, M. A. Armstrong, S. Alexeeff, and J. C. Lo, "Depot medroxyprogesterone acetate, oral contraceptive, intrauterine device use, and fracture risk," Obstetrics & Gynecology, vol. 134, no. 3, pp. 581-589, 2019.
4. J. Cheng et al., "Menstrual irregularity, hormonal contraceptive use, and bone stress injuries in collegiate female athletes in the United States," PM&R, vol. 13, no. 11, pp. 1207-1215, 2021.
5. A. Fine et al., "Comparing estrogen-based hormonal contraceptives and hormone therapy on bone mineral density in women with premature ovarian insufficiency: a systematic review," Menopause, vol. 29, no. 3, pp. 351-359, 2022.
6. J. A. Konopka, L. J. Hsue, and J. L. Dragoo, "Effect of oral contraceptives on soft tissue injury risk, soft tissue laxity, and muscle strength: a systematic review of the literature," Orthopaedic Journal of Sports Medicine, vol. 7, no. 3, p. 2325967119831061, 2019.
7. A. Goshtasebi et al., "Adolescent use of combined hormonal contraception and peak bone mineral density accrual: A meta-analysis of international prospective controlled studies," Clinical Endocrinology, vol. 90, no. 4, pp. 517-524, 2019.
8. L. B. C. Gazarra, C. L. Bonacordi, D. A. Yela, and C. L. Benetti-Pinto, "Bone mass in women with premature ovarian insufficiency: a comparative study between hormone therapy and combined oral contraceptives," Menopause, vol. 27, no. 10, pp. 1110-1116, 2020.
9. S. F. DeFroda, S. L. Bokshan, S. Worobey, L. Ready, A. H. Daniels, and B. D. Owens, "Oral contraceptives provide protection against anterior cruciate ligament tears: a national database study of 165,748 female patients," The Physician and Sportsmedicine, vol. 47, no. 4, pp. 416-420, 2019.
10. S. Palacios et al., "Oestrogen-free oral contraception with a 4 mg drospirenone-only pill: new data and a review of the literature," The European Journal of Contraception & Reproductive Health Care, vol. 25, no. 3, pp. 221-227, 2020.
11. J. Douxfils et al., "Evaluation of the effect of a new oral contraceptive containing estetrol and drospirenone on hemostasis parameters," Contraception, vol. 102, no. 6, pp. 396-402, 2020.
12. H. C. Allaway, M. Misra, E. A. Southmayd, M. S. Stone, C. M. Weaver, D. L. Petkus, and M. J. De Souza, "Are the effects of oral and vaginal contraceptives on bone formation in young women mediated via the growth hormone-IGF-I axis?," Frontiers in Endocrinology, vol. 11, p. 334, 2020.
13. J. A. Konopka, L. Hsue, W. Chang, T. Thio, and J. L. Dragoo, "The effect of oral contraceptive hormones on anterior cruciate ligament strength," The American Journal of Sports Medicine, vol. 48, no. 1, pp. 85-92, 2020.
14. D. Martin, S. B. Cooper, J. C. Tang, W. D. Fraser, C. Sale, and K. J. Elliott-Sale, "Bone metabolic marker concentrations across the menstrual cycle and phases of combined oral contraceptive use," Bone, vol. 145, p. 115864, 2021.
15. A. V. Stone et al., "Oral contraceptive pills are not a risk factor for deep vein thrombosis or pulmonary embolism after arthroscopic shoulder surgery," Orthopaedic Journal of Sports Medicine, vol. 7, no. 1, p. 2325967118822970, 2019.