March 19, 2024

Sarah Taylor, PharmD
Academy Director

Minoxidil was first approved as an oral medication for the management of hypertension in the 1970s. During studies of the drug, it was noted that approximately 20% of patients on oral minoxidil developed hypertrichosis. This finding lead to its eventual development as a topical treatment for alopecia areata in 1987.1 Minoxidil was first made available as a 2% solution, followed by the approval of minoxidil 5% solution in 1993.2 Topical minoxidil remains the mainstay of androgenetic alopecia management for both male and female patients. The mechanism of action of minoxidil for alopecia areata is multimodal and its benefits are expected to be as a result of its effects on vasodilation, its anti-inflammatory effects, and its effect on upregulating vascular endothelial growth factor (VEGF). Minoxidil is FDA approved at both 2% and 5% for male and female patients.3

A Comparison of Concentrations

Topical minoxidil at increasing concentration has been found to be beneficial for treatment of alopecia in some studies. One double-blind, placebo-controlled, randomized trial set out to evaluate the efficacy of topical minoxidil at 5% and 2% concentrations in patients presenting with female pattern hair loss. The study evaluated 381 patients in total ranging from 18 to 49 years of age and supplied one group with a placebo solution in the same vehicle as the minoxidil 5% solution, one group with a 2% topical minoxidil solution, and a third group with 5% topical minoxidil solution. Patients were instructed to apply the solution twice daily and were evaluated for efficacy after 48 weeks of treatment. The 2% minoxidil group was found to be superior to placebo and the 5% minoxidil group was found to be superior to placebo and the 2% minoxidil group, though,

more patients in this group reported pruritis and local irritation than the other groups.4 This study supports the hypothesis that to some degree increased concentration of minoxidil can generate superior results.

A similar double-blind, randomized, placebo-controlled trial in men came to the same conclusion. The study evaluated 393 men with ages ranging from 18 to 49 years of age and supplied one group with a placebo solution, one group with a 2% topical minoxidil solution, and a third group with 5% topical minoxidil solution. Patients were instructed to apply the solution twice daily and were evaluated for efficacy after 48 weeks of treatment. The study found minoxidil 5% clearly superior to 2% topical minoxidil and noted 45% more hair growth at week 48 as well as an earlier response as compared to the 2% group. Much like the study in women, the 5% group did note an increased incidence of adverse effects such as pruritis and local irritation as compared to the 2% and placebo groups.5

These large, randomized placebo controlled trials demonstrate that to some level there is a benefit in increasing the concentration of minoxidil and that greater hair regrowth can be achieved at concentrations up to 5%, though, there is a noted increase in adverse effects at these higher concentrations as noted in both studies.

Is More Always Better?

Though data suggests that 5% is superior to 2% topical minoxidil, little data exists on concentrations above 5% and what data that does exist is mixed. One double-blind, placebo-controlled randomized trial of 90 male patients with androgenetic alopecia evaluated 5% minoxidil as compared to 10% topical minoxidil for hair growth. Patients applied either 5% topical minoxidil, 10% topical minoxidil or placebo over a 36-week period. The study found increased hair count in the 5% minoxidil group compared to 10% minoxidil or placebo and increased irritation in the minoxidil 10% group as compared to the other groups. Overall, the increase in concentration to 10% not only didn't show increased efficacy, it actually showed the opposite and (or perhaps in part because of) increased topical irritation.6 Data is limited on concentrations higher than 10%. One study of minoxidil 15% vs 5% applied twice daily in patients with androgenetic alopecia did find statistically significant improvement in the 15% group as compared to the 5% group.7,8 Another study in women with female pattern hair loss who reported failing to respond to minoxidil 5% did note benefit when these patients were subsequently treated with minoxidil 15% solution. The study noted an increase in more than 13.7% hair count from base line after 12 weeks of treatment, though, it should be noted that this study was not a direct comparison of the two treatments.9 These researchers theorized based on their previous research that those who do not respond to topical minoxidil at 5% concentrations may have a decreased ability to convert minoxidil to it's active minoxidil sulfate form given a lack of sulfotransferase enzyme activity. For these specific patients who have decreased capability of minoxidil conversion to the active form, high concentrations of minoxidil could potentially offer greater benefit than lower concentrations per their studies.9,10

In summary, limited information exists regarding minoxidil in concentrations greater than 5%, some studies have found increased irritation and a lack of benefit at higher concentrations, others have noted increased benefit, with one such study theorizing that increased minoxidil concentrations may be of specific benefit in patients who are non-responders due to a lack of enzymatic activity converting minoxidil to its active form. Given the available information, high concentrations of minoxidil may be appropriate for some patients, however, given the increased potential for irritation lower concentrations for initial therapy should be considered before considering these higher concentrations.

References:

1. Patel P, Nessel T, Kumar D. Minoxidil. National Library of Medicine. Minoxidil - StatPearls - NCBI Bookshelf (nih.gov). Updated December 4th 2023. Accessed December 26th 2023
2. Suchonwanit P, Thammarucha S, Leerunyakul K. Minoxidil and its use in hair disorders: a review [published correction appears in Drug Des Devel Ther. 2020 Feb 10;14:575]. Drug Des Devel Ther. 2019;13:2777-2786. Published 2019 Aug 9. doi:10.2147/DDDT.S214907

3. Kaiser M, Abdin R, Gaumond SI, Issa NT, Jimenez JJ. Treatment of Androgenetic Alopecia: Current Guidance and Unmet Needs. Clin Cosmet Investig Dermatol. 2023;16:1387-1406. Published 2023 May 31. doi:10.2147/CCID.S385861
4. Lucky AW, Piacquadio DJ, Ditre CM, et al. A randomized, placebo-controlled trial of 5% and 2% topical minoxidil solutions in the treatment of female pattern hair loss. J Am Acad Dermatol. 2004;50(4):541-553. doi:10.1016/j.jaad.2003.06.014
5. Olsen EA, Dunlap FE, Funicella T, et al. A randomized clinical trial of 5% topical minoxidil versus 2% topical minoxidil and placebo in the treatment of androgenetic alopecia in men. J Am Acad Dermatol. 2002;47(3):377-385. doi:10.1067/mjd.2002.124088
6. Ghonemy S, Alarawi A, Bessar H. Efficacy and safety of a new 10% topical minoxidil versus 5% topical minoxidil and placebo in the treatment of male androgenetic alopecia: a trichoscopic evaluation. J Dermatolog Treat. 2021;32(2):236-241. doi:10.1080/09546634.2019.1654070
7. Goldust M. Minoxidil 15% solution versus minoxidil 5% solution in the treatment of androgenetic alopecia. Br J Dermatol 2020; 183(Suppl): 91 (abstract BH107).
8. Shreya Singh, Anant Patil, Nika Kianfar, Anna Waśkiel-Burnat, Lidia Rudnicka, Rodney Sinclair, Mohamad Goldust, Does topical minoxidil at concentrations higher than 5% provide additional clinical benefit?, Clinical and Experimental Dermatology, Volume 47, Issue 11, 1 November 2022, Pages 1951–1955, https://doi.org/10.1111/ced.15338
9. McCoy J, Goren A, Kovacevic M, Shapiro J. Minoxidil dose response study in female pattern hair loss patients determined to be non-responders to 5% topical minoxidil. J Biol Regul Homeost Agents. 2016;30(4):1153-1155.
10. McCoy J, Kovacevic M, Situm M, Stanimirovic A, Bolanca Z, Goren A. Doppler laser imaging predicts response to topical minoxidil in the treatment of female pattern hair loss. J Biol Regul Homeost Agents. 2016;30(1):131-134.

For further information or questions, please feel free to reach out to us by heading to www.fagronacademy.us!