Title

"Evaluation of Hair Growth Stimulation via Polydioxanone (PDO) Thread Application: An Observational Pilot Study”

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Abstract

This observational pilot study evaluates the effectiveness of Polydioxanone (PDO) threads for stimulating hair regrowth, expanding on previous findings. PDO threads, widely used in aesthetic medicine for tissue lifting and rejuvenation, are biodegradable polymers with proven biocompatibility and safety. PDO is a well-known synthetic ECM Extracellular Matrix scaffold in the realm of Regenerative Medicine. Using both animal models and clinical human trials, this study assesses hair growth outcomes, underlying biological mechanisms, and safety associated with PDO thread insertion. Results indicate PDO threads significantly promote hair regrowth, comparable to established treatments like minoxidil, via enhanced anagen phase induction, increased follicular cell proliferation, improved local vascularization, and modulation of growth factor activity. With demonstrated efficacy and minimal adverse events, PDO threads emerge as a promising, minimally invasive therapeutic approach for managing androgenetic alopecia (AGA) and potentially other forms of hair loss.

Introduction

Hair loss, especially androgenetic alopecia (AGA), significantly impacts patients' psychological well-being and quality of life. Existing treatments, including minoxidil, finasteride, and hair transplantation, have variable effectiveness and compliance, necessitating the exploration of novel therapeutic alternatives.

PDO threads, initially approved by the FDA as surgical sutures in the 1980s, are biodegradable synthetic polymers with established medical applications, including cosmetic dermatology procedures for skin tightening and rejuvenation (Middleton & Tipton, 1998). Observations by Bharti et al. (2017) previously reported PDO threads' efficacy in hair restoration, prompting Dr. Alan J. Bauman to further investigate their potential through an observational pilot study.

Materials and Methods

PDO threads utilized were sterile, absorbable surgical filaments with approximately six-month biodegradation profiles. Participants included males and females aged 45–58 years, diagnosed with androgenetic alopecia ranging from Norwood scales 3–6 in males, and frontal-temporal to crown thinning in females.

PDO threads were inserted into the scalp using local anesthetic (ring block) and ProNox analgesia, employing radial or parallel insertion patterns spaced at intervals of 0.5–1.0 cm. Thread dimensions varied between 29g x 25mm and 29g x 38mm based on clinical judgment. Efficacy metrics included global photographic documentation, trichoscopy, and Hair Mass Index (HMI). Follow-up evaluations were conducted at six months post-treatment.

Results

Clinical follow-up revealed significant improvements in hair density, thickness, and HMI scores. Notably, one patient demonstrated a 48% increase in HMI, and all patients had visibly improved coverage and improved hair growth on global photos. Previously performed animal studies corroborated clinical findings and elucidated the mechanism, showing PDO threads significantly enhanced hair regrowth and extended anagen phases through increased follicular cell proliferation (Shin et al., 2015).

Discussion

PDO threads likely enhance hair growth via multiple biological pathways, including neo-collagenesis, improved local blood supply, and modulation of hair growth factors (Yoon et al., 2019). Notably, PDO threads increased the expression of anagen-promoting FGF-7 and decreased the anagen cessation factor FGF-5. Minimal adverse effects, consistent with existing literature, included mild discomfort, temporary erythema, and rare instances of thread extrusion (Bharti et al., 2017).

Study limitations include its observational nature, small sample size, and absence of a randomized control group. Larger, controlled studies are recommended to refine techniques and further assess long-term efficacy.

Conclusion

PDO threads represent a promising, minimally invasive regenerative medicine therapy for hair regrowth, suitable either as a standalone or adjunctive treatment. Further rigorous clinical trials are recommended to standardize protocols and optimize patient outcomes.

References

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