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Peptides as Anti-Aging Agents: A Promising Path? A Systematic Review and Meta-Analysis of Randomized Controlled Trials Evaluating Efficacy and Adverse outcomes

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Introduction & Objectives:

As aging predominantly affects the skin, recent advancements have highlighted the potential of collagen peptide-based supplements, administered orally or topically, as promising agents for skin rejuvenation. Peptides function as signaling molecules that stimulate collagen synthesis and enhance extracellular matrix components, improving skin texture, reducing wrinkles, and increasing elasticity and hydration. Notably, ELASTEN®, containing collagen peptides and essential nutrients, significantly improved skin hydration, elasticity, and texture in randomized trials. Similarly, topical peptide formulations like Matrixyl have demonstrated significant reductions in wrinkle volume, offering effective, non-invasive alternatives to traditional cosmetic procedures. Our meta-analysis aims to evaluate the effectiveness of peptides in reducing visible signs of skin aging, compare the effects of different peptide types and delivery methods, and investigate potential adverse effects related to peptide use in both topical and oral forms.

Materials & Methods:

A thorough systematic review and meta-analysis was conducted in accordance with PRISMA guidelines. A comprehensive search was performed through Medline, Cochrane, and Embase databases, up to the year 2024 without time limitation.

Results:

The results of our meta-analysis from 16 randomized controlled trials conducted between 1995 and 2023, demonstrate that peptide treatments significantly enhance skin hydration (test for overall effect: $Z = 5.34$, $p < 0.00001$) and reduce wrinkle depth (test for overall effect: $Z = 5.20$, $p < 0.00001$). Subgroup analyses reveal that serums are particularly effective in delivering peptides, outperforming creams, lotions, and gels in enhancing skin hydration (SMD = -0.90, 95% CI: -1.06 to -0.74). Oral peptide supplementation was effective in improving skin texture (test for overall effect: $Z = 4.76$, $p < 0.00001$), with subgroup analysis indicating that the duration of supplementation played a role in the observed benefits ($p = 0.03$). Additionally, signal peptides show the strongest effect in reducing wrinkle depth (SMD = -0.85, 95% CI: -1.02 to -0.68), while enzyme inhibitor peptides significantly improve skin firmness (SMD = -0.78, 95% CI: -0.94 to -0.62) and neurotransmitter-inhibitor peptides enhance skin elasticity (SMD = -0.65, 95% CI: -0.83 to -0.47). Oral peptide supplementation also positively affects skin texture and tone (SMD = -0.60, 95% CI: -0.76 to -0.44).

Safety profiles indicate minimal adverse effects for topical applications, whereas oral treatments are generally well-tolerated but associated with mild gastrointestinal disturbances in 12% of cases.

Conclusion:

Overall, the findings support the effectiveness of peptides in the non-invasive treatment of skin aging. Thus, we recommend the inclusion of peptide-based products in anti-aging skincare regimens. Healthcare providers should consider these non-invasive treatments as viable options for patients looking to address signs of aging. Future studies should further investigate the long-term safety and efficacy of peptide treatments to refine their use in dermatology. Our results highlight peptides as a significant advancement in dermatological therapy, offering high efficacy and good tolerability for improving skin health and aesthetics.

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