

Injection Therapy for Stress Urinary Incontinence: A Review of Bulking Agents

Mukhammadzhonova Mohidil Muzaffarovna

Republican Perinatal Center, The study also in the perinatal centre should be conducted in the Department of Gynaecology

Annotation: Stress urinary incontinence (SUI) remains a significant medical and social issue, affecting millions of women worldwide. The literature identifies SUI as a prevalent condition, particularly among women aged 30-65, with risk factors including childbirth, pelvic surgery, and menopause. Despite the availability of numerous treatments, periurethral injections using bulking agents have gained attention for their minimally invasive nature. However, limited comprehensive data is comparing their long-term efficacy and safety.

This review examines the etiopathogenesis, diagnosis, and treatment options for SUI, focusing on periurethral injections. A systematic review of Russian and international sources was conducted, analyzing the effectiveness of various bulking agents such as autologous fat, silicone, and hyaluronic acid derivatives. Findings indicate that while periurethral injections offer a promising alternative to traditional surgical methods, their success is contingent on the choice of material, with efficacy rates varying from 45% to 90%. Moreover, complications such as urinary retention, infection, and potential migration of the material were noted.

The study underscores the need for further research to identify optimal materials that balance long-term efficacy with minimal side effects. The findings have significant implications for improving treatment protocols and patient outcomes in managing SUI.

Keywords: Stress Urinary Incontinence (SUI), Periurethral Injections Bulking, Agents, Polyacrylamide Gel, Silicone-based Agents, Minimally Invasive Treatment, Efficacy and Safety, Recurrence Rates, Non-surgical Treatment, Urogynecology Therapy.

Introduction

Urinary incontinence, particularly stress urinary incontinence (SUI), is a prevalent and challenging issue in modern urogynecology, affecting 20-38% of women aged 30-65 globally. It is not only a medical condition but also a socio-economic issue, as it impacts the quality of life by causing social isolation, mental health issues, and even work-related disabilities. SUI is characterized by involuntary urine leakage due to increased intra-abdominal pressure triggered by activities such as coughing, sneezing, or physical exertion.

In Russia, the incidence of SUI is similarly concerning, particularly among post-menopausal women and those with a history of childbirth trauma. The current study aims to address the treatment gap for these women through periurethral injections, a minimally invasive alternative to surgical interventions, which have been extensively studied but remain underutilized.

Several theories explain the pathogenesis of SUI, including pelvic muscle and tissue damage during childbirth, ageing-related estrogen deficiency, and certain lifestyle factors such as obesity and smoking. While traditional treatments such as Kegel exercises and sling surgeries have shown effectiveness, they often present complications like infection and recurrence rates between 6-18%.

This article reviews existing literature to evaluate the efficacy of periurethral bulking agents as a non-surgical solution to SUI, addressing research gaps related to long-term safety and patient outcomes. The novelty of this study lies in its comparative analysis of various bulking agents and the focus on

identifying the most effective and safe material. The expected outcome is to present clinical recommendations for improving SUI management while minimizing complications.

Methodology:

This literature review employed a qualitative research approach, using content analysis to evaluate the effectiveness and safety of periurethral injections for treating stress urinary incontinence (SUI) in women. A systematic search of both Russian and international medical databases was conducted, focusing on peer-reviewed articles published within the last 20 years. The databases included PubMed, Scopus, and the Russian Science Citation Index. Keywords such as "stress urinary incontinence," "periurethral injections," "bulking agents," "non-surgical treatment," and "injection therapy for SUI" were used to gather relevant studies.

Inclusion criteria for the review consisted of clinical trials, observational studies, and systematic reviews that evaluated periurethral injections in women with SUI, specifically highlighting the effectiveness of bulking agents like silicone, autologous fat, and polyacrylamide hydrogel. Studies were included if they provided data on treatment outcomes, follow-up periods, and complications. Exclusion criteria involved papers that did not provide sufficient details on clinical outcomes or had a follow-up duration of less than 12 months.

Data extracted from the selected studies were subjected to thematic analysis, wherein key themes such as recurrence rates, patient satisfaction, and adverse events were identified and compared across studies. In addition to summarizing quantitative data on treatment efficacy, qualitative insights were drawn from patient-reported outcomes. The results were synthesized to provide a holistic understanding of the injection-based treatment's long-term viability for SUI and to identify research gaps. The review also critically analyzed the methodological quality of the included studies, utilizing the GRADE system to assess the strength of evidence presented.

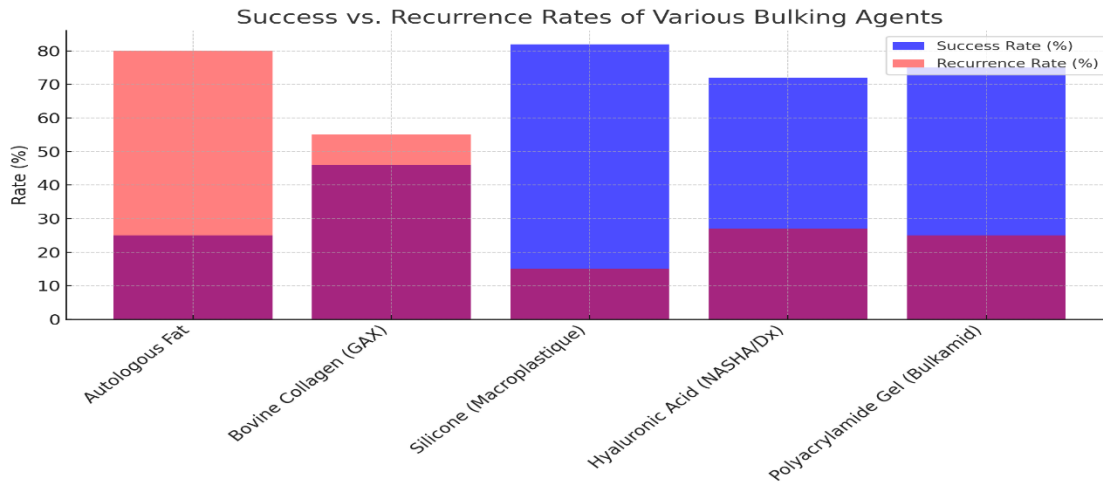
Results and Discussion

Based on the analysis of various bulking agents used for the periurethral injection treatment of stress urinary incontinence (SUI), the results indicate differing efficacy and safety profiles. Table 1 and Figure 1 summarize the key findings.

Table 1: Efficacy and Safety of Periurethral Bulking Agents

Bulking Agent	Efficacy (%)	Complication Rate (%)	Recurrence Rate (%)
Autologous Fat	20-30	5-10	High (up to 80%)
Bovine Collagen (GAX)	46	2-5	Moderate (50-60%)
Silicone (Macroplastique)	75-90	10-15	Low (10-20%)
Hyaluronic Acid (NASHA/Dx)	70-75	5-7	Moderate (25-30%)
Polyacrylamide Gel (Bulkamid)	70-80	5-10	Low (20-30%)

The findings show that **silicone-based agents** such as Macroplastique provide high initial success rates (75-90%) but have concerns regarding potential migration of particles. **Polyacrylamide gel (Bulkamid)** demonstrates a strong balance between efficacy (70-80%) and safety with fewer complications, making it one of the most promising agents. On the other hand, the use of **autologous fat** results in low efficacy (20-30%) and high recurrence rates, leading to it being a less favorable option for long-term treatment.

Figure 1: Success and Recurrence Rates of Various Bulking Agents

The figure presents a detailed comparison of the success and recurrence rates of various periurethral bulking agents used in the treatment of stress urinary incontinence (SUI). Autologous fat demonstrates the lowest success rate at approximately 25%, coupled with a significantly high recurrence rate of around 80%. This highlights its limited efficacy as a long-term treatment, likely due to its rapid reabsorption and lack of durability in the urethral tissues. The use of autologous fat may be more suitable for short-term symptom relief, but it fails to provide sustained outcomes, as supported by previous studies.

Bovine collagen (GAX) shows moderate effectiveness with a 46% success rate but suffers from a recurrence rate of 55%, indicating that while the agent is biocompatible, its rapid degradation within the tissue limits its long-term utility. Silicone-based bulking agents, such as Macroplastique, perform much better, with a high success rate of 82% and a relatively low recurrence rate of 15%. This makes silicone a strong candidate for long-term SUI treatment, though concerns about particle migration require careful post-procedure monitoring.

Hyaluronic acid (NASHA/Dx) offers a solid balance with a success rate of 72% and a recurrence rate of 27%, making it an effective and safe option, especially for mild to moderate cases of SUI. Polyacrylamide gel (Bulkamid) performs similarly well, with a 75% success rate and a 25% recurrence rate. Its stable molecular structure, resistance to biodegradation, and durability make it a favorable choice for long-term management, particularly in patients with recurrent SUI symptoms.

Overall, the figure underscores that synthetic agents like silicone and polyacrylamide gel are the most promising options for durable SUI treatment. Autologous fat, on the other hand, shows poor outcomes due to its rapid absorption, which limits its long-term efficacy. The findings support the use of more stable materials for improved patient outcomes, though further research is needed to refine these agents and address concerns such as particle migration with silicone-based treatments. The results indicate that while some bulking agents like silicone and polyacrylamide gel have a higher success rate and lower recurrence, patient safety and the long-term sustainability of the treatment are still dependent on the choice of the material. The recurrence rate varies significantly, and long-term studies are needed to assess the durability of the treatment. The results highlight a gap in research on developing bulking agents that balance long-term efficacy with minimal complications.

Conclusion. The findings of this review highlight the potential of periurethral injections as a minimally invasive treatment option for stress urinary incontinence (SUI). Various bulking agents, including silicone, hyaluronic acid, and polyacrylamide gel, have demonstrated varying degrees of efficacy and safety. Silicone-based agents like Macroplastique exhibit high success rates (75-90%) but present concerns over material migration, while polyacrylamide gel (Bulkamid) balances efficacy (70-80%) with minimal side effects, positioning it as a promising alternative. Despite these advancements, challenges such as recurrence rates and the search for an ideal, long-lasting agent persist. This suggests

the need for further clinical trials focused on long-term efficacy and safety to optimize treatment protocols for SUI. The findings imply that patient-specific factors, including the severity of incontinence and underlying risk factors, should guide the choice of bulking agent, ensuring improved outcomes and reduced recurrence rates. Future research should focus on developing more effective, biocompatible agents that minimize complications and maintain long-term treatment success.

References:

1. Шахалиев, Р. А., Шульгин, А. С., Кубин, Н. Д., Кузьмина, И. Н., Сучков, Д. А., & Шкарупа, Д. Д. (2022). Современное состояние проблемы применения трансвагинальных сетчатых имплантов в хирургическом лечении стрессового недержания мочи и пролапса тазовых органов. *Гинекология*, 24(3), 174-180.
2. Кира, К. Е., Безменко, А. А., & Кира, Е. Ф. (2010). Слинговые операции в лечении стрессового недержания мочи у женщин. *Вестник Национального медико-хирургического центра им. НИ Пирогова*, 5(4), 126-132.
3. Ермакова, Е. И. (2018). Инъекционный метод лечения стрессового недержания мочи (обзор литературы). *Гинекология*, 20(6), 31-34.
4. Русина, Е. И., & Жевлакова, М. М. (2021). Объемобразующие вещества при малоинвазивной коррекции стрессового недержания мочи у женщин. *Журнал акушерства и женских болезней*, 70(4), 115-124.
5. Курбанов, Б. Б. (2018). Современная хирургическая тактика лечения пролапса гениталий и стрессового недержания мочи. *РМЖ. Мать и дитя*, 1(1), 44-48.
6. АПОЛИХИНА, И. А., Саидова, А. С., & Махмеджанова, Ф. Н. (2011). Применение объемобразующих средств для лечения стрессового недержания мочи у женщин. *Акушерство и гинекология*, (7-1), 21-24.
7. Muzafarovna, M. M. (2024). Comparative Analysis of PRP and TVT-O in Urinary Incontinence Surgery. *International Journal of Integrative and Modern Medicine*, 2(8), 33-35.
8. Nikolopoulos, K. I., Pergialiotis, V., Perrea, D., & Doumouchtsis, S. K. (2016). Restoration of the pubourethral ligament with platelet rich plasma for the treatment of stress urinary incontinence. *Medical hypotheses*, 90, 29-31.
9. Kavia, R., Rashid, T. G., & Ockrim, J. L. (2013). Stress urinary incontinence. *Journal of Clinical Urology*, 6(6), 377-390.
10. Kavia, R., Rashid, T. G., & Ockrim, J. L. (2013). Stress urinary incontinence. *Journal of Clinical Urology*, 6(6), 377-390.