

DURABILITY OF COLLAGEN INJECTION FOR SUI IN WOMEN PROVEN BY TRANSVAGINAL 3D ULTRASOUND

Hypothesis / aims of study

To evaluate the durability of collagen injection (CI) using serial 3-dimensional transvaginal ultrasound (3D US) in a cohort of women with sufficient improvement of stress urinary incontinence (SUI) for not requiring additional treatment.

Study design, materials and methods

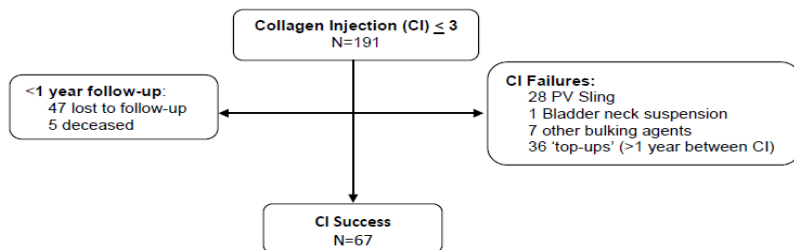
After IRB approval, a retrospective review of patients undergoing CI from 1999 to 2011 at one institution was conducted. Eligible patients included those who received 3 or less CI for mixed, primary, or recurrent SUI with a minimum follow-up of 1 year from the last CI and no reinjection afterwards during the follow-up period. CI failures who subsequently required further anti-incontinence procedures such as pubovaginal fascial sling, tension-free vaginal sling placement, or different types of injectable bulking agents were excluded in this study. Patients were assessed in office for symptomatic improvement based on history and using serial 3-D US for collagen volume and distribution by experienced sonographers at 6 weeks postoperatively and every 6-12 months depending on clinical scenario.

Two-tailed paired student's t-test was used to analyze continuous variables. A mixed model was used to analyze if there was a significant change in 3D collagen volume over time by treating the patients as random effects (i.e. subjects that are being measured multiple times) and the time of measurement since the last injection and the total number of injections as fixed effects (i.e. the variables that are being measured on the subjects). Volume was used as the dependent variable. Mixed model analysis model simultaneously accounts for between-patient correlation and the within-patient correlation, and was selected to reflect the differences in volume over time rather than just the first and last visit volumes.

Results

Of 191 eligible patients, 67 (35%) met study criteria with sufficient SUI improvement for not requiring additional treatment (Figure 1).

Figure 1. Strobe diagram of eligible CI patients.



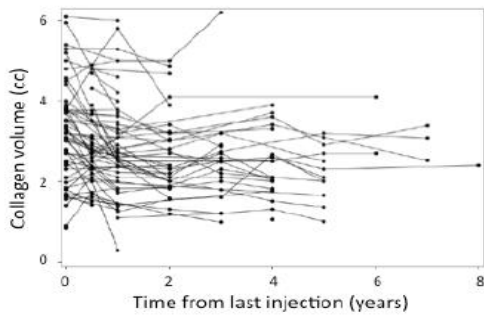
Mean age [67 years (42-90)] and other demographic characteristics are shown in Table 1.

| | |
|--------------------------------|------------------|
| Mean age (range) | 67 (42- 90) |
| Mean BMI (range) | 27.2 (18.5-27.2) |
| Mean Parity (range) | 2.3 (0-7) |
| Prior incontinence surgery (%) | 31 (46%) |

Mean follow-up from time of last CI was 43 months (12-149). A total of 283 3-D US were performed with a mean of 4 (2-11) per patient. 43 patients required only 1 CI, whereas 21 had 2 CI, and 3 had 3 CI. Mean number of injections was 1.4 (1-3). Table 2 demonstrates the results according to length of follow-up. Overall mean injected volume was 5.8 cc (2-18cc). Volume retention rate compared to baseline volume was 84% (12-100). Collagen volume was plotted over time from the time of the last injection in patients having successful responses (Figure 2).

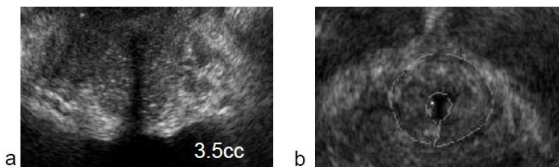
| Follow-up Interval (years) | # of patients | Mean Age (years) | # of PCI | Mean Total Injected Volume (cc) | Mean Post-op Baseline Volume (cc) | Mean Last Visit Volume (cc) | % Retained Volume (cc) |
|----------------------------|---------------|------------------|----------|---------------------------------|-----------------------------------|-----------------------------|------------------------|
| 1-2 | 21 | 68 | 1.4 | 5.3 | 3.4 | 2.9 | 85% |
| >2-5 | 33 | 70 | 1.5 | 6.2 | 3.2 | 2.7 | 77% |
| >5 | 13 | 62 | 1.2 | 5.5 | 2.9 | 2.5 | 80% |

Figure 2. Collagen volume over time from last injection for successful CI patients



Mean collagen volumes were statistically different at post-operative baseline compared to last follow-up visit (3.2 versus 2.7 cc, $p=0.008$). Mixed model analysis used to assess serial 3-D US collagen volumes determined that collagen volume decreased by 0.11cc for each year past the final injection (95% CI: (-0.18, -0.04), p -value = 0.0014). Majority of patients with sufficient improvement 54 (81%) had circumferential distribution of collagen. An example of circumferential distribution of collagen on 3D US is demonstrated in Figure 3a and 3b.

Figure 3. Transverse (a) and coronal (b) transvaginal US views of collagen with 3.5cc volume and circumferential distribution in a successful CI patient.



Interpretation of results

In this long-term study analyzing objective results of CI by 3D US over time in a cohort of women with durable results not wishing to undergo additional SUJ treatment, we found that 24% of our patients had a durable response greater than 2 years without the need for 'top-up' injection or need for additional procedures. In patients with successful CI, serial 3D US demonstrated that collagen volume decreases slowly at 0.11cc per year from the time of last injection suggesting that select patients who have durability responses can avoid repeat injection or other SUJ treatments longer than previously thought. The 3D US appearance of collagen did not substantially change and remained easy to assess, arguing against the effect of a collagenase degrading it over time.

Concluding message

Although believed to be non-durable, the results of CI can be stable over time in a subset of patients with SUJ. Transvaginal 3D US should be considered when assessing durability of future bulking agents as a cost-effective and well-tolerated tool useful for clinical decision making.

Disclosures

Funding: None **Clinical Trial:** No **Subjects:** NONE