



# Gold Thread Implantation for Female Sexual Dysfunction and Vaginal Laxity: A Preliminary Investigation

Su Mi Kim<sup>1</sup>, Young Seok Won<sup>2</sup>, Seul Ki Kim<sup>3,4</sup>

<sup>1</sup>Department of Obstetrics and Gynecology, Chungbuk National University Hospital, Cheongju, Korea, <sup>2</sup>JungDaWoon Clinic, Seongnam, Korea, <sup>3</sup>Department of Obstetrics and Gynecology, Seoul National University Bundang Hospital, Seongnam, Korea, <sup>4</sup>Department of Obstetrics and Gynecology, Seoul National University College of Medicine, Seoul, Korea

**Objectives:** We evaluated the efficacy of gold thread implantation (GTI) in the vulva and vagina to improve female sexual dysfunction (FSD) and vaginal laxity.

**Methods:** A retrospective chart review was conducted on 46 women who underwent GTI between 2017 and 2018 at our institution. Physicians interviewed patients using questionnaires at baseline and 1–3 months post-treatment. The questionnaires consisted of eight questions: vaginal laxity, vaginal dryness, pain during intercourse, sexual satisfaction during intercourse, sexual arousal confidence, sexual satisfaction of partner, frequency, and maintaining lubrication.

**Results:** Overall, participants experienced significant improvement after GTI treatment ( $P < 0.0001$ ). The median score of vaginal laxity was 3 (slightly loose) at baseline and 5 (slightly tight) at post-treatment. Vaginal dryness also improved from 4 (moderate) at baseline to 2 (little) at post-treatment. The degree of pain during intercourse decreased from 3 to 1. The sexual satisfaction score was 3 (moderately dissatisfied) at baseline and 4 (about equally satisfied and dissatisfied) at post-treatment. Sexual confidence of arousal increased from a score of 3 (low confidence) at baseline to 4 (moderate confidence) at post-treatment. They perceived greater partner sexual satisfaction, moving from a score of 2 to 4. Participants reported lubrication was more frequent during sexual activity, which was maintained until completion of sexual activity. Both scores regarding lubrication increased from 3.5 at baseline to 5 at post-treatment.

**Conclusions:** GTI may be an option for FSD and vaginal laxity.

**Key Words:** Atrophic vaginitis, Dyspareunia, Gold, Needle, Sexual dysfunction

## INTRODUCTION

In recent years, there has been an increased interest in sexual health. Many women consider it an important part of their general health and life satisfaction [1,2]. In a large scale study, 44.2% of women self-reported that they have experienced sexual problems [3]. Female sexual dysfunction (FSD) is associated with complex physiological and psychological symptoms, significantly less is understood in comparison to male sexual

dysfunction [4]. FSD is defined as the various ways that a woman is unable to participate in a sexual relationship as they wish [5]. FSD was subclassified into 3 items according to The Diagnostic and Statistical Manual of Mental Disorders, the fifth edition (DSM-V); female sexual interest/arousal disorder, genitopelvic pain/penetration disorder, female orgasmic disorder [6]. FSD differs from sexual distress; the latter is defined by individual emotions about their sexuality, such as anxiety, frustration, and unhappiness [7]. The prevalence

Received: December 26, 2019 Revised: July 3, 2020 Accepted: August 4, 2020

Address for Correspondence: Seul Ki Kim, Department of Obstetrics and Gynecology, Seoul National University Bundang Hospital, 82 Gumi-ro 173beon-gil, Bundang-gu, Seongnam 13620, Korea

Tel: 82-31-787-7264, E-mail: sskim@snuh.org, ORCID: <https://orcid.org/0000-0002-1647-6711>

Address for Correspondence: Young Seok Won, JungDaWoon Clinic, 3 Sanseong-daero 295beongil, Sujeong-gu, Seongnam 13354, Korea

Tel: 82-31-747-9944, E-mail: unasyn12@naver.com, ORCID: <https://orcid.org/0000-0001-6792-8944>

Young Seok Won's current affiliation is Chungdambom Women's Clinic, 620 Samsung-ro, Gangnam-gu, Seoul 06085, Korea (82-2-6191-0030).

of FSD was reported to be diverse, from 13.3% to 79.3% [8-10]. FSD could result from medical comorbidities, depression, stress, and aging [11].

Vaginal laxity is defined as looseness of the vaginal opening which differs from pelvic organ prolapse, which is the descent of one or more genito-pelvic structures [12,13]. Although vaginal laxity is poorly understood, it is relatively common complaint and a survey of the International Urogynecological Association physicians reported that over 80% of their patients underreported vaginal laxity [14]. As aging progresses, reductions in vaginal wall elasticity and lubrication are common. Subsequently, sensation during intercourse is decreased and vaginal dryness or irritation occurs [15,16]. Therefore, vaginal laxity and dryness could be one of the causes of FSD [13,17].

There is a growing demand to improve the management of FSD; consequently, non-invasive, office-based treatments, including radiofrequency and laser therapies, are gaining popularity and becoming more readily available [13,18]. Gold thread implantation (GTI) has been performed actively in the field of dermatology for some time, especially for skin tightening and wrinkle reduction [19,20]. However, we lack the evaluation of GTI for FSD and vaginal laxity. To the best of our knowledge, this is the first study to investigate GTI in the field of gynecology and sexology. The objective of this study was to evaluate the efficacy of the application of GTI in the vulva and vagina to improve FSD and vaginal laxity.

## MATERIALS AND METHODS

### Participants

A retrospective chart review was employed for 46 women who received GTI between August 2017 and December 2018. This study was approved by the Institutional Review Board (IRB) of Seoul National University Bundang Hospital (IRB No. B-1906-544-107). Women over the age of 35 years and complaining one of the following symptoms were included. Participants were asked to select all that apply: (1) vaginal laxity defined as a vaginal laxity questionnaire score  $\leq 3$  ( $n = 27$ , 58.7%); (2) vaginal dryness defined as a vaginal dryness score  $\geq 4$  ( $n = 25$ , 54.3%); (3) sexual pain defined as a pain score during intercourse  $\geq 3$  ( $n = 30$ , 65.2%); (4) low sexual satisfaction defined as sexual satisfaction questionnaire score  $\leq 3$  ( $n = 42$ , 91.3%); (5) low sexual confidence of arousal defined as sexual confidence of

arousal score  $\leq 3$  ( $n = 35$ , 76.1%); and (6) problems of lubrication defined as the frequency of lubrication score  $\leq 3$  ( $n = 27$ , 58.7%) or maintaining of lubrication score  $\leq 3$  ( $n = 28$ , 60.9%).

### Study protocol

For the assessment of treatment outcomes, physicians interviewed patients using questionnaires at baseline and 1–3 months post-treatment (Supplementary, available online). The questionnaire consisted of (1) vaginal laxity score (1 = very loose, 2 = moderately loose, 3 = slightly loose, 4 = neither loose nor tight, 5 = slightly tight, 6 = moderately tight, 7 = very tight) [13,21]; (2) vaginal dryness score (1 = none, 2 = little, 3 = fair, 4 = moderate, 5 = severe, 6 = very severe); (3) pain score during intercourse (0–5 scale); (4) sexual satisfaction during intercourse (1 = none, 2 = very dissatisfied, 3 = moderately dissatisfied, 4 = about equally satisfied and dissatisfied, 5 = moderately satisfied, 6 = very dissatisfied) [21]; (5) sexual satisfaction of partner during intercourse (0–5 scale); (6) sexual confidence of arousal (1 = no sexual activity, 2 = very low or no confidence, 3 = low confidence, 4 = moderate confidence, 5 = high confidence, 6 = very high confidence); (7) frequency of lubrication (1 = no sexual activity, 2 = almost never or never, 3 = a few times [less than half of the time], 4 = sometimes [about half of the time], 5 = most times [more than half the time], 6 = almost always); and (8) maintaining of lubrication (1 = no sexual activity, 2 = almost never or never, 3 = a few times [less than half of the time], 4 = sometimes [about half of the time], 5 = most times [more than half the time], 6 = almost always). Questions 4, 6, 7, and 8 were extracted from the female sexual function index (FSFI) [11].

### Materials and procedures

The implant material was non-absorbable, 0.07 mm diameter gold threads (Hyunseok Medical, Seoul, Korea). It spirally wrapped around the 30-gauge needle. This needle was inserted and removed, placing the gold threads in the intact tissue. Under intravenous sedation, sterile drapes were applied with the patient in a lithotomy position. Variable lengths of gold threads were employed, depending on the insertion sites – 38 mm or 50 mm for the dermis and subcutaneous layer of the labia majora; and 13 mm for the surroundings of the clitoris and labia minora; 25 mm for the vaginal introitus and walls between the lamina propria and muscular layer. 25 mm gold threads were inserted at 3, 6, 9, and

12 o'clock of the vaginal wall. The same procedure sequence was applied to all patients.

### Statistical analysis

All statistical analyses were performed using IBM SPSS ver. 22 (IBM Corp., Armonk, NY, USA). The Wilcoxon signed-rank test was used to compare the scores between pre- and post-treatment. All  $P$  values  $< 0.05$  were considered significant.

## RESULTS

Forty-six subjects received GTI. The median age and parity were 48.5 years (interquartile range, 45.0–53.3 years) and 2.0, respectively (Table 1). Two subjects who had no experience of pregnancy were included. GTI procedures were well tolerated, and there was no occurrence of procedure-related adverse events, such as vaginitis. The baseline and post-GTI scores were presented in Table 2.

For all variables, subjects showed significant improve-

ment after GTI treatment. Forty-one subjects (89.1%) reported improvement of vaginal laxity. The median score of vaginal laxity was 3 (slightly loose) at baseline and 5 (slightly tight) at post-treatment ( $P < 0.0001$ ). Vaginal dryness also improved from a score of 4 (moderate) at baseline to 2 (little) at post-treatment ( $P < 0.0001$ ). Forty subjects (87.0%) experienced improvement of vaginal dryness. The degree of pain during intercourse, with a possible range of 0 to 5, decreased from a score of 3 to 1 ( $P < 0.0001$ ).

Similarly, subjects reported improvement in sexual satisfaction and confidence of arousal during intercourse. The sexual satisfaction score at baseline was 3 (moderately dissatisfied), which increased to 4 (about equally satisfied and dissatisfied) at post-treatment ( $P < 0.0001$ ). Sexual confidence of arousal was increased from a score of 3 (low confidence) at baseline to 4 (moderate confidence) at post-treatment. Moreover, they perceived greater partner's sexual satisfaction, increasing from a score of 2 to 4, with a possible range of 0 to 5 ( $P < 0.0001$ ). Subjects reported that lubrication was more frequent during sexual activity or intercourse, and maintained longer until completion of sexual activity or intercourse. Both scores regarding lubrication were 3.5 at baseline and 5 at post-treatment ( $P < 0.0001$ ).

## DISCUSSION

In the present study, GTI exhibited statistically significant improvements in FSD and vaginal laxity. After GTI treatment, sexual satisfaction and confidence of

**Table 1.** Demographics and clinical characteristics of subjects

Characteristic	Value
Age (y)	48.5 (45.0–53.3)
BMI (kg/m <sup>2</sup> )	22.2 (20.4–25.0)
Parity	2.0 (2.0–2.0)
Gravity	2.0 (2.0–3.0)
Delivery type	
Vaginal	31 (67.4)
Cesarean	13 (28.3)
Menopausal status	
Premenopausal	25 (54.3)
Postmenopausal	19 (41.3)
HRT	
Yes	14 (30.4)
No	30 (65.2)
HRT duration	24.0 (4.5–43.5)
Pap smear	
Normal	33 (71.7)
Abnormal <sup>a</sup>	1 (2.2)
Unknown results	5 (10.9)

Data are presented as a median (interquartile range) or number (%).

BMI: body mass index, HRT: hormonal replacement therapy.

<sup>a</sup>One abnormal result was ASCUS (atypical squamous cells of undetermined significance).

**Table 2.** Changes in questionnaire scores before and after gold thread implantation (GTI)

Variable	Baseline	Post-GTI	$P$ value*
Vaginal laxity	3 (2–4)	5 (4–6)	$< 0.0001$
Vaginal dryness	4 (3–5)	2 (2–3)	$< 0.0001$
Sexual pain	3 (2–4)	1 (1–2)	$< 0.0001$
Sexual satisfaction	3 (2–3)	4 (3.8–5)	$< 0.0001$
Sexual satisfaction of partner	2 (1–3)	4 (3–4)	$< 0.0001$
Sexual confidence of arousal	3 (2–3)	4 (4–5)	$< 0.0001$
Lubrication_frequency	3.5 (3–4)	5 (4–5)	$< 0.0001$
Lubrication_maintaining	3.5 (3–4)	5 (4–5)	$< 0.0001$

Data are presented as a median (interquartile range). The median values were compared by Wilcoxon signed rank test.

\* $P < 0.05$  was considered significant.

arousal were increased, and vaginal dryness and dyspareunia were decreased. The outpatient GTI treatment was well tolerated without the occurrence of any adverse effects.

Gold threads have been applied in various clinical settings (e.g., eyelid weight in facial palsy patients, material for odontology treatment) without substantial immunologic reactions [22]; they have even been used as additives in foods and cosmetic products. Pure gold might be a clinically-useful material that is stable, nonimmunologic, nonallergic, antibacterial, and inoffensive to the organism [23,24]. Although gold is considered safe material, the complications associated with gold implantation have been reported after treatment for lagophthalmos, such as hypersensitivity reaction, local inflammatory reactions [25,26].

GTI was first introduced to the field of dermatology about 50 years ago by Dr. Caux in France [27]; however, the mechanisms of GTI is poorly understood. Rondo Júnior et al. [27] performed punch biopsies on an anterior arm of 10 women after GTI. They observed the synthesis of plentiful collagen and elastic fibers without tissue rejection. They have suggested that GTI promotes skin tension through the formation of collagen and reticulin fibers. Shin et al. [19] have found that GTI might promote angiogenesis, as there were rich blood vessels in comparison to other regions. In animal studies, researchers also found the stimulated production of collagen. Kurita et al. [28] investigated the effects of lifting the threads in a rat model for over seven months. Interestingly, the amount of collagen was increased gradually throughout the study period with long-lasting tissue reactions. They concluded that GTI sustained collagen formation, which may support tissue tension for a prolonged period. Kim et al. [29] unexpectedly observed hair re-growth after GTI for facial lifting in a 38-year-old female patient. They underwent GTI on the dorsal skin of mice. They found that it induced not only hair growth but also substantial collagen deposition in the dermis. Through these findings, we could speculate that GTI in the vulva and vagina may increase collagen production and angiogenesis, ultimately promoting the elasticity and regeneration of connective tissues. As a result, FSD and vaginal laxity might be improved. Also, as neocollagenesis and neovascularization would restore the vaginal environment to a healthy state, vaginal lubrication could be improved [30]. At the same time, caution should be taken providing GTI because it is still an experimental procedure. It is im-

portant to provide enough information to the patients before GTI treatment to make an informed choice.

The limitations of this study include the retrospective nature of the work, small sample size, and short follow-up period. Further studies with large sample size are required to better elucidate the therapeutic mechanisms and long-term safety of GTI.

In conclusion, GTI may be a potential treatment for FSD and vaginal laxity by promoting collagen and elastic fiber synthesis.

## CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

## REFERENCES

1. Dawson ML, Shah NM, Rinko RC, Veselis C, Whitmore KE. The evaluation and management of female sexual dysfunction. *J Fam Pract* 2017; 66: 722-8.
2. Schmiedeberg C, Huyer-May B, Castiglioni L, Johnson MD. The more or the better? How sex contributes to life satisfaction. *Arch Sex Behav* 2017; 46: 465-73.
3. Shifren JL, Monz BU, Russo PA, Segreti A, Johannes CB. Sexual problems and distress in United States women: prevalence and correlates. *Obstet Gynecol* 2008; 112: 970-8.
4. Derogatis LR, Sand M, Balon R, Rosen R, Parish SJ. Toward a more evidence-based nosology and nomenclature for female sexual dysfunctions-part I. *J Sex Med* 2016; 13: 1881-7.
5. Allahdadi KJ, Tostes RC, Webb RC. Female sexual dysfunction: therapeutic options and experimental challenges. *Cardiovasc Hematol Agents Med Chem* 2009; 7: 260-9.
6. Sungur MZ, Gündüz A. A comparison of DSM-IV-TR and DSM-5 definitions for sexual dysfunctions: critiques and challenges. *J Sex Med* 2014; 11: 364-73.
7. Qureshi AA, Sharma K, Thornton M, Myckatyn TM, Tenenbaum MM. Vaginal laxity, sexual distress, and sexual dysfunction: a cross-sectional study in a plastic surgery practice. *Aesthet Surg J* 2018; 38: 873-80.
8. McCabe MP, Sharlip ID, Lewis R, Atalla E, Balon R, Fisher AD, et al. Incidence and prevalence of sexual dysfunction in women and men: a consensus statement from the Fourth International Consultation on Sexual Medicine 2015. *J Sex Med* 2016; 13: 144-52.
9. Wolpe RE, Zomkowski K, Silva FP, Queiroz APA, Sperandio FF. Prevalence of female sexual dysfunction in Brazil: a systematic review. *Eur J Obstet Gynecol Reprod Biol* 2017; 211: 26-32.
10. Mitchell KR, Mercer CH, Ploubidis GB, Jones KG, Datta J, Field N, et al. Sexual function in Britain: findings from the third National

- Survey of Sexual Attitudes and Lifestyles (Natsal-3). *Lancet* 2013; 382: 1817-29.
11. Lee Y, Lim MC, Joo J, Park K, Lee S, Seo S, et al. Development and validation of the Korean version of the Female Sexual Function Index-6 (FSFI-6K). *Yonsei Med J* 2014; 55: 1442-6.
  12. American College of Obstetricians and Gynecologists and the American Urogynecologic Society; INTERIM UPDATE: This Practice Bulletin is updated as highlighted to reflect the US Food and Drug Administration order to stop the sale of transvaginal synthetic mesh products for the repair of pelvic organ prolapse. Pelvic organ prolapse. *Female Pelvic Med Reconstr Surg* 2019; 25: 397-408.
  13. Krychman M, Rowan CG, Allan BB, DeRogatis L, Durbin S, Yacoubian A, et al. Effect of single-treatment, surface-cooled radiofrequency therapy on vaginal laxity and female sexual function: the VIVEVE I randomized controlled trial. *J Sex Med* 2017; 14: 215-25.
  14. Pauls RN, Fellner AN, Davila GW. Vaginal laxity: a poorly understood quality of life problem; a survey of physician members of the International Urogynecological Association (IUGA). *Int Urogynecol J* 2012; 23: 1435-48.
  15. Sokol ER, Karram MM. Use of a novel fractional CO2 laser for the treatment of genitourinary syndrome of menopause: 1-year outcomes. *Menopause* 2017; 24: 810-4.
  16. Campbell P, Krychman M, Gray T, Vickers H, Money-Taylor J, Li W, et al. Self-reported vaginal laxity-prevalence, impact, and associated symptoms in women attending a urogynecology clinic. *J Sex Med* 2018; 15: 1515-7.
  17. Vale F, Rezende C, Raciolan A, Bretas T, Geber S. Efficacy and safety of a non-hormonal intravaginal moisturizer for the treatment of vaginal dryness in postmenopausal women with sexual dysfunction. *Eur J Obstet Gynecol Reprod Biol* 2019; 234: 92-5.
  18. Lin HY, Tsai HW, Tsui KH, An YF, Lo CC, Lin ZH, et al. The short-term outcome of laser in the management of female pelvic floor disorders: focus on stress urine incontinence and sexual dysfunction. *Taiwan J Obstet Gynecol* 2018; 57: 825-9.
  19. Shin KC, Bae TH, Kim WS, Kim HK. Usefulness of gold thread implantation for Crow's feet. *Arch Plast Surg* 2012; 39: 42-5.
  20. Suh DH, Jang HW, Lee SJ, Lee WS, Ryu HJ. Outcomes of polydioxanone knotless thread lifting for facial rejuvenation. *Dermatol Surg* 2015; 41: 720-5.
  21. Millheiser LS, Pauls RN, Herbst SJ, Chen BH. Radiofrequency treatment of vaginal laxity after vaginal delivery: nonsurgical vaginal tightening. *J Sex Med* 2010; 7: 3088-95.
  22. Choo PH, Carter SR, Seiff SR. Upper eyelid gold weight implantation in the Asian patient with facial paralysis. *Plast Reconstr Surg* 2000; 105: 855-9.
  23. Berry CW, Moore TJ, Safar JA, Henry CA, Wagner MJ. Antibacterial activity of dental implant metals. *Implant Dent* 1992; 1: 59-65.
  24. Nejrup K, Olivarius Nde F, Jacobsen JL, Siersma V. Randomised controlled trial of extraarticular gold bead implantation for treatment of knee osteoarthritis: a pilot study. *Clin Rheumatol* 2008; 27: 1363-9.
  25. Kilduff CLS, Casswell EJ, Imonikhe R, Marjanovic B. Type IV hypersensitivity to gold weight upper-eyelid implant: case report and review of the literature. *Ocul Immunol Inflamm* 2018; 26: 910-4.
  26. Nunes TP, Sardinha M, Pereira IC, Lunardelli P, Matayoshi S. [Gold weight implantation: premature and late complications]. *Arq Bras Oftalmol* 2007; 70: 599-602. Portuguese.
  27. Rondo Júnior W, Vidarte G, Michalany N. Histologic study of the skin with gold thread implantation. *Plast Reconstr Surg* 1996; 97: 256-8.
  28. Kurita M, Matsumoto D, Kato H, Araki J, Higashino T, Fujino T, et al. Tissue reactions to cog structure and pure gold in lifting threads: a histological study in rats. *Aesthet Surg J* 2011; 31: 347-51.
  29. Kim JH, Cho EY, Kwon E, Kim WH, Park JS, Lee YS, et al. Gold thread implantation promotes hair growth in human and mice. *Lab Anim Res* 2017; 33: 291-7.
  30. Eder SE. Early effect of fractional CO2 laser treatment in post-menopausal women with vaginal atrophy. *Laser Ther* 2018; 27: 41-7.