Striae and Pelvic Relaxation: Two Disorders of Connective Tissue with a Strong Association

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Pelvic relaxation, a weakening of pelvic support structures, is an under-reported condition that affects a multitude of women. In the United States alone, more than 338,000 procedures for prolapse are performed annually. Decreased collagen content has been noted in the tissues of women affected by this condition. Interestingly, biopsy specimens of women with striae also show a diminution of collagen. Using self-reported anonymous data, we compared the prevalence of striae in women with and without pelvic relaxation to see if an association between these two disorders of connective tissue existed. More than half the women with prolapse (54.7%) (n = 41) reported striae, whereas only 25.0% of women in the non-prolapse group (n = 8) reported striae (P < 0.01). Multivariate logistic regression analysis confirmed striae as a significant risk factor for the development of clinical prolapse (odds ratio 3.12, P < 0.05). There appears to be a strong association between the presence of striae and the development of pelvic relaxation, which is unrelated to conventionally cited risk factors, such as age, weight, number of pregnancies, or postmenopausal status.


INTRODUCTION

Pelvic relaxation in women is a condition in which pelvic support structures weaken and allow pelvic organs, such as the uterus, bladder, or rectum, to prolapse, and in some cases protrude partially or completely through the vaginal introitus. Symptoms associated with this condition include pelvic pressure, pain, seeing or feeling a vaginal bulge, and incontinence (urinary and/or rectal) (Fornell et al., 2004; Smith and Appell, 2005). Currently, aging, childbirth, chronic straining or coughing, weak levator ani musculature, and neurological injury are considered potential risk factors (Michael et al., 2003), but there are no reliable methods for predicting who will develop pelvic relaxation. A non-invasive, cost-effective screening method for the early identification of women at high risk for the development of pelvic relaxation and its resultant morbidities would enable the implementation of preventive strategies, such as pelvic floor muscle exercises, when they would be most beneficial.

As a decrease in collagen content has been noted in both striae (Watson et al., 1998) and pelvic relaxation (Goh, 2003; Michael et al., 2003), we designed a study that would compare the prevalence of striae in women with and without pelvic relaxation to see if an association existed between these two disorders of connective tissue that might ultimately be used to identify high risk individuals.

RESULTS

The study was performed using a total of 116 surveys collected from urogynecology patients (n = 71) and skin cancer patients (n = 45). The surveys were completed in the waiting rooms or exam rooms, before each patient’s appointment. Among all respondents, the average age was 59.7 years (range 25–90 years), average weight was 151.7 lbs (range 98–279 lbs), and average number of pregnancies was 2.2 (range 0–8). One hundred eight (93.1%) respondents provided complete information regarding prolapse symptoms. A board certified obstetrician/gynecologist (S.A.S.) reviewed each questionnaire to assess self-reported symptoms associated with a diagnosis of clinical prolapse (Fornell et al., 2004; Smith and Appell, 2005). Self-reported symptoms included any one or more of the following: pelvic pressure, urinary incontinence, protrusion of pelvic organs through the vagina, or a “falling down” or “dropped” sensation. The frequency of each symptom among subjects with clinical prolapse was 25.0, 50.9, 24.1, and 26.7%, respectively. A total of 70.4% (n = 76) of respondents were classified in the clinical prolapse category on the basis of either a previous diagnosis or self-reported symptoms. The majority of the patients with clinical prolapse came from the urogynecology group with a prevalence more than double that found in the Mohs group (81.7 vs 40%, n = 58 vs 18). Unexpectedly, 87% of women in the non-prolapse group compared to 63.0% of women in the prolapse group were postmenopausal (P < 0.02). When the group with prolapse and the group without prolapse were compared by age,
Table 1. Characteristics of women with prolapse compared to women without prolapse

<table>
<thead>
<tr>
<th>Variable</th>
<th>Prolapse (n=76)</th>
<th>Non-prolapse (n=32)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age</td>
<td>59</td>
<td>64.4</td>
<td>0.09</td>
</tr>
<tr>
<td>Weight (lbs)</td>
<td>155</td>
<td>148</td>
<td>0.31</td>
</tr>
<tr>
<td>% Striae</td>
<td>54.7%</td>
<td>25.0%</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>% Postmenopausal</td>
<td>63.5%</td>
<td>86.7%</td>
<td>&lt;0.02</td>
</tr>
<tr>
<td>% Varicose veins</td>
<td>22.4%</td>
<td>12.5%</td>
<td>0.24</td>
</tr>
<tr>
<td>% Hemorrhoids</td>
<td>18.4%</td>
<td>21.9%</td>
<td>0.68</td>
</tr>
<tr>
<td>% Preterm labor</td>
<td>2.6%</td>
<td>3.1%</td>
<td>0.89</td>
</tr>
<tr>
<td>Pregnancies (mean)</td>
<td>2.4%</td>
<td>2.0%</td>
<td>0.29</td>
</tr>
</tbody>
</table>

Table 2. Characteristics of women with striae compared to women without striae

<table>
<thead>
<tr>
<th>Variable</th>
<th>Striae (n=53)</th>
<th>Non-striae (n=61)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age</td>
<td>57.2</td>
<td>61.8</td>
<td>0.12</td>
</tr>
<tr>
<td>Weight (lbs)</td>
<td>161</td>
<td>144</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>% Postmenopausal</td>
<td>64.2%</td>
<td>70.2%</td>
<td>0.51</td>
</tr>
<tr>
<td>% Varicose veins</td>
<td>26.4%</td>
<td>11.5%</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>% Hemorrhoids</td>
<td>22.6%</td>
<td>14.8%</td>
<td>0.28</td>
</tr>
<tr>
<td>% Preterm labor</td>
<td>3.8%</td>
<td>1.6%</td>
<td>0.48</td>
</tr>
<tr>
<td>Pregnancies (mean)</td>
<td>2.4%</td>
<td>2.0%</td>
<td>0.14</td>
</tr>
</tbody>
</table>

weight, skin type, presence of hemorrhoids, presence of varicose veins, easy bruising, hypertension, preterm labor, and number of pregnancies, no statistically significant differences were noted (see Table 1).

The overall prevalence of striae was 46.5% (n = 53), but more than half the women with prolapse (54.7%) (n = 41) reported striae, whereas only 25.0% of women in the non-prolapse group (n = 8) reported striae (P < 0.01). When comparing subjects with and without striae, the presence of varicose veins and weight were the only variables in which a significant difference was detected (see Table 2). Varicose veins affected 26.4% of women with striae (n = 14) and only 11.5% of the women without striae (n = 7, P < 0.05); the number of pregnancies, oral steroid use, easy bruising, hypertension, preterm labor, and presence of hemorrhoids were not significantly different between the two groups. The mean weight for subjects with striae was 161 lbs, but 143 lbs for those without striae (P < 0.01). When controlling for weight between the prolapse and non-prolapse groups, however, the odds ratio for striae as a predictor of clinical prolapse was 3.39 (P < 0.02), demonstrating that the presence of striae, independent of weight, is a risk factor for the development of prolapse. In addition, a multivariate analysis controlling for age, weight, postmenopausal status, varicose veins, hemorrhoids, preterm labor, number of pregnancies, and use of oral steroids identified striae as the only significant predictor of clinical prolapse (odds ratio 3.12, P < 0.05, Table 3).

DISCUSSION

There is no consensus as to how many women are affected by pelvic relaxation. The literature reports a prevalence rate of prolapse of 7-70%, depending on the population being studied (Samuelsson et al., 1999; Swift, 2000; Hendrix et al., 2002; Piya-Anant et al., 2003; Chuenchompoonut et al., 2005; Tegerstedt et al., 2005), but many women with prolapse are not formally diagnosed and, therefore, the condition is probably far more prevalent than currently estimated. Many women are symptomatic but are older and do not routinely seek gynecological care, and therefore, the condition is probably far more prevalent than currently estimated. Many women are symptomatic but are older and do not routinely seek a gynecologist, may be embarrassed and do not seek care, or are uninformed and do not know that there are treatments available, all of which likely leads to under-reporting of this condition. At present, there are no successful methods for predicting women who will develop prolapse.

Early identification of women at risk for the development of pelvic relaxation and its resultant morbidities may be of great benefit as several modifiable risk factors (obesity, smoking, caffeine) have been identified (Bradley and Nygaard, 2005). There is also evidence that pelvic floor muscle exercises can retard the progression of already established severe prolapse (Piya-Anant et al., 2003), and early treatment may help reduce resultant morbidities such as cervical ulceration or chronic vulvar irritation. Women who present with symptoms of pelvic organ prolapse, including visualization of a bulge from the vagina (Bradley and Nygaard, 2005), pelvic pressure, urinary incontinence, and fecal incontinence (Fornelli et al., 2004; Smith and Appell, 2005) show greater degrees of pelvic relaxation than women who present without symptoms (Digues et al., 2005). Therefore, it is important to identify those women with asymptomatic prolapse to prevent the progression of the condition. A non-invasive cost-effective screening method that would easily identify at risk women would guide physicians in counseling patients as to lifestyle changes as
well as allow them to implement treatment strategies early when they would be most beneficial. Although some of these symptoms are associated with modifiable lifestyle factors, such as obesity, smoking, and caffeine intake (Bradley and Nygaard, 2005), this study suggests there may also be inherited factors, such as the tendency to develop striae gravidarum.

Similar to pelvic relaxation, striae distensae (stretch marks) is a condition with an unknown etiology. There is a lack of information in the medical literature about striae, but several potential risk factors including infant birth weight, body mass index, weight gain in pregnancy, and age (Davey, 1972) have been proposed. In our study, there was a significant difference in the average current weights of patients with striae when compared to those of patients without striae; however, when controlling for weight between the prolapse and non-prolapse groups, the odds ratio for striae as a predictor of clinical prolapse validated that the association between striae and prolapse is independent of weight. Controlling for current age, weight, postmenopausal status, varicose veins, hemorrhoids, preterm labor, number of pregnancies, and use of oral steroids, striae remained a significant independent risk factor for the development of clinical prolapse (Table 3). A recent retrospective study found that genetic factors, such as personal history, family history, and race, were the most significant predictors for the development of striae (Chang et al., 2004). Similarly, our findings of a higher incidence of striae in women with pelvic organ prolapse by a 2:1 ratio could potentially be explained by a common genetically predetermined defect in connective tissue, in both of these conditions. It also suggests that striae may indeed have predictive value.

Although this study noted a strong association between striae and prolapse, there were several potentially confounding variables that were not addressed, including route of delivery, incidence and degree of laceration at the time of delivery, duration of pushing at delivery, and the timing or duration of hormone replacement therapy. In addition, the diagnosis of clinical prolapse was made based on self-reported symptoms, not an actual exam, allowing for the possibility of misclassification of the subjects. An extension of this study that controls for the above variables and that uses pelvic examinations to document the presence or absence of prolapse would eliminate many of these limitations.

Conclusion
The prevalence of striae in women with pelvic organ prolapse is more than double of that in women without prolapse. This strong association between the two conditions suggests that striae may be considered a risk factor for the development of pelvic relaxation. Future prospective studies will help clarify the role of striae as a screening tool for identifying women at risk for the development of pelvic relaxation.

MATERIALS AND METHODS
The source population consisted of two groups of subjects, those being seen in an outpatient urogynecology clinic and those being seen in an outpatient dermatology clinic, from February 2005 to June 2005. The urogynecology patients were chosen owing to the expected high incidence of prolapse, whereas the dermatology patients, who were undergoing Mohs micrographic surgery for non-melanoma skin cancer, were chosen because they were likely to have similar demographic features, such as age, skin type, and body mass index, but were not expected to have a higher incidence of prolapse than in the general population for this age group. Patients who were interested in participating in the study were instructed to request a survey, complete the survey anonymously, and either deposit it in a drop box in the waiting room or hand it to a member of the office staff. The urogynecology patients requested 83 surveys but only completed 71 surveys, for a response rate of 85.5%. The dermatology patients requested 46 surveys and completed 46 surveys, for a response rate of 100%. The surveys included demographic questions as well as questions about stretch marks, prolapse, ethnicity, skin type, medical history, and medication history.

A determination of clinical prolapse was based upon either an official diagnosis of prolapse as determined by physical exam, or self-reported symptoms of pelvic pressure, urinary incontinence, or pelvic organ (uterus/bladder/rectum) protrusion through the vaginal introitus. Although not diagnostic of pelvic relaxation, there is evidence that these symptoms are associated with vaginal support defects (Stenchever and Fenner, 2001; Fornell et al., 2004; Handa et al., 2004; Bradley and Nygaard, 2005; Smith and Appell, 2005). Respondents with clinical prolapse were compared to respondents without clinical prolapse in the categories of age, striae, skin type, postmenopausal status, hypertension, hemorrhoids, varicose veins, easy bruising, preterm labor, and number of pregnancies. Surveys that lacked data for any specific characteristic were not included in the statistical analysis of that category.

A sample size of 114 subjects was derived by assuming an alpha of 0.05%, a power of 0.90, an incidence of striae in patients with pelvic organ prolapse of 80% and an incidence of striae in patients without pelvic organ prolapse of 50%. These figures were determined by a previous retrospective study showing the incidence of striae gravidarum in the general population to be approximately 55% (Chang et al., 2004). Statistical analysis of categorical variables was implemented using Pearson’s χ² test, whereas continuous variables were analyzed using the Student’s t-test. Multivariate logistic regression analysis was then performed to assess significant predictors of clinical prolapse. All calculations were performed using Stata 8.0, College Station, TX. The Partner’s Healthcare Organization Institutional Review Board approved this study and the Declaration of Helsinki protocols were followed.

CONFLICT OF INTEREST
The authors state no conflict of interest.

REFERENCES
SA Salter et al.
Striae, a Risk Factor for Pelvic Relaxation


