RESEARCH LETTER

Potential Use of Pulse Oximetry for the Diagnosis of Testicular Torsion

Scrotal Doppler ultrasonography (scrotal US) has been commonly used for evaluating patients with suspected testicular torsion (TT).1,2 However, scrotal US is not available in all medical facilities. Comparatively, pulse oximetry is easily available at all institutions; it is used for monitoring pulse oximeter saturation (SpO2) with an accuracy equivalent to that of conventional arterial oxygen saturation (SaO2) and is the standard for noninvasive SaO2 monitoring in most medical facilities.3 We evaluated the SpO2 and pulse rate (PR) values on the scrotums of patients undergoing exploration for TT to determine whether these values are feasible for monitoring testicular viability in TT.

Methods | This study was a prospective case series. After the institutional review board approval was obtained, data of patients scheduled to undergo scrotal exploration for suspected TT, including their clinical history; physical examination; scrotal US, surgical, and pathological findings; and the average SpO2 and PR values were recorded.

For obtaining SpO2 and PR, patients were initially placed in the supine position. The pulse oximeter (OxiMax N-65; Tyco Health Care Group) was attached with an adhesive sensor pad on the scrotal skin surface overlying the affected testes. The contralateral side (normal testis or control) was monitored in the same manner as the affected side (Figure). Mean SpO2 and PR values were obtained from the average of the individual measures at 3 points, as recorded by the senior urologists at our center. A Wilcoxon signed-rank test was used to evaluate the significance of the differences in the estimated SpO2 values and PRs between the affected and control sites.

Results | Sixteen patients (mean [SD] age, 9.2 [5.8] years; range, 1-19 years) who were consecutively undergoing scrotal exploration were recruited for the study. The symptom onset occurred within 24 hours (mean [SD], 13.6 [4.5] hours; range, 3-22 hours). Painful and swollen or erythematous scrotum was reported in 11 patients and scrotal pain, in 5 patients. No blood flow signals were detected by scrotal US in any of the torsed testes. Good-quality signals for SpO2 and PRs were obtained in all normal testes. In all of the affected testes, both SpO2 values and PRs were undetectable. Differences in the SpO2 values and PRs between the affected and control sites are shown in the Table. There were statistically significant differences in SpO2 values and PRs between testes with TT and normal testes.

Discussion | Pulse oximetry measures the ability of oxygenated hemoglobin to reflect light at different wavelengths.4-6 Our results demonstrate that SpO2 values and PRs were undetectable in all of the torsed testes, in contrast to that in nor-

Table. Differences in SpO2 Values and PRs Between the Affected and Control Sites in 16 Patients Using the Wilcoxon Signed-Rank Test (Nonparametric Analysis)

<table>
<thead>
<tr>
<th>Testis</th>
<th>Range</th>
<th>Mean (SD)</th>
<th>IQR</th>
<th>P Value</th>
<th>25th</th>
<th>50th (Median)</th>
<th>75th</th>
</tr>
</thead>
<tbody>
<tr>
<td>SpO2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affected</td>
<td>0</td>
<td>0</td>
<td></td>
<td>&lt;.01</td>
<td>96.33</td>
<td>97.67</td>
<td>98.5</td>
</tr>
<tr>
<td>Control</td>
<td>96.0-99.33</td>
<td>97.46 (1.15)</td>
<td>2.17</td>
<td></td>
<td>96.33</td>
<td>97.67</td>
<td>98.5</td>
</tr>
<tr>
<td>PR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affected</td>
<td>0</td>
<td>0</td>
<td></td>
<td>&lt;.01</td>
<td>103.67</td>
<td>107.67</td>
<td>109.17</td>
</tr>
<tr>
<td>Control</td>
<td>96.0-114.0</td>
<td>106.46 (4.56)</td>
<td>5.5</td>
<td></td>
<td>103.67</td>
<td>107.67</td>
<td>109.17</td>
</tr>
</tbody>
</table>

Abbreviations: IQR, interquartile range; PR, pulse rate; SpO2, pulse oximeter saturation.
mal subjects. However, it may be difficult to diagnose epididymal torsion compared with TT using pulse oximetry, as the epididymis is relatively difficult to locate owing to its small size. This shortcoming may be overcome with subsequent improvements in oximetry techniques.

Conclusions | In conclusion, pulse oximetry can be used for monitoring hemodynamic changes of the affected testis attributed to its small apparatus design, noninvasiveness, and general availability. In comparison, the estimate of the cost of pulse oximetry is around $600, which is 1.2% of the cost of Doppler US. Therefore, it can be useful in resource-constrained settings in which there is no access to US. However, future studies are warranted to evaluate the test characteristics of pulse oximetry for detecting TT based on using US and surgical findings as the gold standards and, nonetheless, to reliably differentiate among the various conditions of acute scrotum such as torsed appendage or epididymo-orchitis.

Hsiao-Wen Chen, MD
Li-Chueh Weng, PhD
Ta-Min Wang, MD
Kwai-Fong Ng, MD

Author Affiliations: Division of Urology, Chang Gung Memorial Hospital, Medical College, Chang Gung University, Taoyuan, Taiwan (Chen, Wang); School of Nursing, Chang Gung University, Taoyuan, Taiwan (Weng); Department of Pathology, Chang Gung Memorial Hospital, Medical College, Chang Gung University, Taoyuan, Taiwan (Ng).

Corresponding Author: Hsiao-Wen Chen, MD, Division of Urology, Chang Gung Memorial Hospital, Medical College, Chang Gung University, 3, Fushing Street, Gueishan, Taoyuan, Taiwan 333 (mhct1211@cgmh.org.tw).


Conflict of Interest Disclosures: None reported.


Weight Labeling and Obesity: A Longitudinal Study of Girls Aged 10 to 19 Years

Anti-obesity efforts that rely on stigmatizing weight (eg, using harsh language or stereotypical portrayals of overweight individuals) may impede health promotion efforts, as weight stigma is often negatively related to behavior change and thus seems unlikely to result in weight loss. Indeed, considerable research underscores the detrimental effects of weight stigma on the physical health and well-being of children and adolescents, and nationally representative, longitudinal data show weight-based discrimination is associated with weight gain among older individuals. Although the childhood weight stigma literature frequently examines overt and often malicious behaviors (eg, bullying), stigma processes can begin when an individual experiences weight labeling. By labeling someone as overweight, the negative stereotypes, status loss, and mistreatment associated with this label may now be applicable to the individual. Recent research suggests that the negative psychological effects of weight stigma can begin when one is simply labeled as “too fat” by others. However, the relationship between weight labeling and weight gain remains unknown. Thus, we examined if weight labeling during childhood was related to the likelihood of having an obese body mass index (BMI) nearly a decade later.

Methods | Sample. The National Heart, Lung, and Blood Institute Growth and Health Study followed up girls who self-identified as black (n = 1213) or white (n = 1166) from age 10 years until age 19 years. Extensive study information is available at https://biolinc.nhlbi.nih.gov/static/studies/nghs/Protocol.pdf. The National Heart, Lung, and Blood Institute Growth and Health Study protocol was approved by institutional review boards at all 3 sites (University of California, Berkeley; University of Cincinnati; and Westat/Group Health Association, Rockville, Maryland). The University of California, Los Angeles Institutional Review Board provided human subjects approval for the current study. The child provided written assent and a parent/guardian provided written informed consent until the child became 18 years old, at which point she provided written informed consent.

Measures. A parent or guardian provided income and education information at baseline. Certified staff conducted anthropometry and collected information on pubertal timing and weight labeling. Weight labeling was assessed by asking participants, “Have any of these people told you that you were too fat?” followed by a list that included father, mother, brother, sister, best girlfriend, boy you like best, any other girl, any other boy, and teacher. Participants reporting “yes” to any item were considered “labeled.”

Results | Participants without BMI data at age 19 years (n = 317) were excluded from analyses. These participants did not differ in baseline BMI, weight labeling, or race but had slightly lower levels of household income and parental education. At baseline, 57.9% (n = 1188) of participants reported being labeled. Black girls reported more weight labeling than white girls (χ² = 16.13, P < .001), although this difference was small (p = 0.089). Baseline BMI and weight labeling status were moderately correlated (r = 0.41, P < .001). Logistic regression analyses (Table) evaluated the association between baseline labeling and obesity 10 years later. Adjusting for baseline BMI, household income, parental education, race, and age at menarche, being labeled “too fat” at age 10 years remained a significant predictor of obesity at age 19 years (odds ratio = 1.66). The odds ratio was 1.62 when family members were...