GEMs
GOOD EVIDENCE MATTERS

GEMs of the Week

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What's in this week's issue?

Week of August 29 - September 2, 2022

SPOTLIGHT: Does Auscultation Identify Cardiac Conditions Associated with Sudden Cardiac Death?

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- Analyzing the Effect of High School Football on Adult Mental Health: Is It Okay to Play?
- A Low Glycemic Load Diet in Women with PCOS Helps Regulate Hunger Hormones

Does Auscultation Identify Cardiac Conditions Associated with Sudden Cardiac Death?

Do 'Pathologic' Cardiac Murmurs in Adolescents Identify Structural Heart Disease? An Evaluation of 15,141 Active Adolescents for Conditions that Put Them at Risk of Sudden Cardiac Death

Austin AV, Owens DS, Prutkin JM, et al. Do 'pathologic' cardiac murmurs in adolescents identify structural heart disease? An evaluation of 15,141 active adolescents for conditions that put them at risk of sudden cardiac death. *Br J Sports Med*. 2022; 56(2):88–94. doi:10.1136/bjsports-2019-101718

KEY TAKEAWAY: Characterizing a murmur as pathologic vs physiologic does not accurately define the presence of SHD with risk of SCD; therefore, all murmurs in adolescents aged 12 to 19 years old should be worked up, starting with an EKG.

STUDY DESIGN: Retrospective analysis

LEVEL OF EVIDENCE: STEP 3

BRIEF BACKGROUND INFORMATION: Personal cardiac history, family cardiac history, cardiac symptoms, and heart auscultation have long been part of the sports pre-participation exam. Detection of a murmur on cardiac auscultation can be an indication that structural heart disease is present, but varying skill and experience alter accuracy of murmur classification. Furthermore, it is estimated that in individuals with hypertrophic cardiomyopathy, only 25% have an audible murmur. This study was aimed at assessing classification of murmurs and their risk for structural heart disease and risk for sudden cardiac death.

PATIENTS: Adolescents 12 to 19 years old

INTERVENTION: ECHO performed after detection of murmur

CONTROL: ECHO performed in patients without murmur

PRIMARY OUTCOME: ECHO detection of structural heart disease related to sudden cardiac death

METHODS (BRIEF DESCRIPTION):

- Retrospective analysis of 15,141 adolescents 12–19 years old, undergoing sports related heart screening.
- Participants were surveyed on medical history (personal and family), while screening consisted of blood pressure measurement, height and weight measurement, cardiac auscultation (standing, supine and supine with Valsalva), full physical examination, and resting 12 lead ECG.
- Physical exams were performed by residents, fellows, attendings, and advanced care providers from specialties including cardiology, primary care, and sports medicine. These physicians classified the murmurs as either physiologic or pathologic.
  - Physiologic: Grade 1-2/6 systolic, flow/ejection, decreased or no change with Valsalva, or mild/soft
  - Pathologic: Grade 3/6 systolic or greater, harsh, increased with Valsalva, diastolic, radiating, click/gallop/splitting, crescendo-decrescendo or holosystolic
- Indications for ECHO included clinically relevant history, presence of cardiac murmur, presence of marfanoid features, blood pressure ≥160/100 mmHg, or abnormal ECG.
- Limited echocardiogram performed for participants with any type of murmur, clinically relevant history, Marfan habitus, and/or systolic blood pressure ≥160, or diastolic blood pressure ≥100.

INTERVENTION (# IN THE GROUP): 905

COMPARISON (# IN THE GROUP): 4,333

FOLLOW UP PERIOD: Not applicable

RESULTS:

- No significant difference in positive predictive value of physiologic vs pathologic murmurs and structural heart disease (2.4% vs 4.3%, respectively; *P*=.21).
- Statistically significant difference in positive predictive value of having a murmur vs no murmur and identifying structural heart disease (2.8% vs 1.4%, respectively; *P*=.003).
- Of the participants, 905 had a murmur. 743 classified as physiologic, 162 as pathologic.
  - 25 individuals (2.8%) with murmurs and 61 individuals (1.4%) without murmurs had structural heart disease.
  - Three individuals (0.3%) in the murmur group were diagnosed with hypertrophic cardiomyopathy (HCM). This was the only condition this study discovered associated with sudden cardiac death.
  - Two individuals with HCM had physiologic murmurs while remaining individual with HCM had a pathologic murmur.
  - All three individuals with HCM had abnormal ECGs.

LIMITATIONS:

- Study only included adolescents 12–19 years old and cannot be applied to others outside this range.
- Varying levels of physician skill and interpretation, without expert confirmation may have added to variability in findings.
- Exams were performed inside a tent inside a noisy gym, potentially affecting ability to hear and/or classify a murmur.
- This analysis only included data from individuals that received an ECHO. Undetected pathology may have been missed with "normal" heart screening.
- Use of limited ECHO may have missed cardiac pathology.

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Finding Fluid: Techniques to Improve Accuracy of Knee Ultrasound

Identification of Knee Effusions With Ultrasound: A Comparison of Three Methods

Cushman DM, Ross B, Teramoto M, English J, Joyner JR, Bosley J. Identification of Knee Effusions With Ultrasound: A Comparison of Three Methods. *Clin J Sport Med*. 2022; 32(1):e19-e22. doi:10.1097/JSM.0000000000000823

KEY TAKEAWAY: Both parapatellar pressure and quadriceps contraction improve detection of suprapatellar effusion over static scanning. Quadriceps contraction is superior to parapatellar pressure in identifying grade one or occult effusions.

STUDY DESIGN: Prospective cohort study

LEVEL OF EVIDENCE: STEP 3

BRIEF BACKGROUND INFORMATION: Knee effusions are a common finding within both painful and painless knees. Ultrasound can be used for detection. Identifying fluid in the suprapatellar space with ultrasound can improve accuracy of knee injections. This study compares different methods to static scanning.

PATIENTS: Adults with or without knee pain at an orthopedic clinic

INTERVENTION: Parapatellar pressure or quadriceps contraction

CONTROL: Static sonographic scanning

PRIMARY OUTCOME: Identification of fluid in the suprapatellar recess on ultrasound

METHODS (BRIEF DESCRIPTION):

- 52 patients (104 knees) were recruited from an orthopedic clinic. Recruitment was through consecutive sampling.
- Exclusion criteria included knee injections within the last year, transtibial or transfemoral amputation, rheumatologic condition of the knee, knee surgery within the last year, or a history of knee replacement.
- Patients completed a questionnaire about demographics and pain level. 57 of the knees were painful.
- A trained sonographer who completed residency and advanced training scanned both knees.
- Two images were obtained using static scanning, parapatellar pressure, and quadriceps contraction for a total of six images per patient.
- A second blind sonographer reviewed the images.
- Fluid was graded based on joint capsule distension using a system created by Hartung to assess inter-rater reliability.

INTERVENTION (# IN THE GROUP): 52 (104 knees)
COMPARISON (# IN THE GROUP): 52 (104 knees)

FOLLOW UP PERIOD: Not applicable

RESULTS:

- For detection of knee effusion, quadriceps contraction outperforms parapatellar pressure (proportion ratio [PR] 1.3; 95% CI, 1.2–1.5) and static scanning (PR 1.7; 95% CI, 1.4–2.1).
- Parapatellar pressure is better than static scanning (PR 1.3; 95% CI, 1.1–1.5).

LIMITATIONS:

- Ultrasound was the only imaging used so intra-articular pathology was not identified.
- Because no intra-articular pathology was investigated the study could not assess the relationship between intra articular knee pathology and fluid. A knee can be painful and have fluid without intra-articular pathology present.
- Hartung grading criteria for knee effusion was used but there are other validated criteria. While the other criteria may not be superior, having a uniform grading system would make results more comparable across studies.

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Analyzing the Effect of High School Football on Adult Mental Health: Is It Okay to Play?

High School Football and Midlife Brain Health Problems

Iverson GL, Merz ZC, Terry DP. High-School Football and Midlife Brain Health Problems. *Clin J Sport Med*. 2022; 32(2):86–94. doi:10.1097/JSM.0000000000000898

KEY TAKEAWAY: High school football may be associated with a greater risk for >1 concussions, but this was not associated with a greater risk for adult anxiety or depression compared to other contact sports, no-contact sports, or no sports participation.

STUDY DESIGN: Cross-sectional cohort study

LEVEL OF EVIDENCE: STEP 3

BRIEF BACKGROUND INFORMATION: Chronic Traumatic Encephalopathy (CTE) has been a topic of concern amongst professional football players, causing parents to be concerned about letting their children play football as adolescents.

PATIENTS: Males 35-55 years old

INTERVENTION: Participation in high school football

CONTROL: Other contact sports, non-contact sports, or no sports participation

PRIMARY OUTCOME: Anxiety, depression

METHODS (BRIEF DESCRIPTION):

- Male, U.S. citizens, 35-55 years old were recruited using a crowd-sourcing platform.
- Men who played high school football were then selected based on response to a survey created by the research team that ascertain basic demographic information, current physical, psychological and cognitive symptoms, history of involvement in various sports, medical history, and concussion history.
- Similarly, men who played other contact sports, non-contact sports or no sports were selected based on survey responses.
- Outcomes were measured utilizing two surveys:
  1) The PHQ-8 which is a modified version of the PHQ-9. The cutoff score for screening positively for depression on the PHQ-8 is 10 and participants were asked to report symptoms within the last two weeks.
  2) The British Columbia Post-Concussion Symptom Inventory is a 16-item questionnaire designed to assess the frequency and severity of symptoms of post-concussion syndrome. The 13 item scores are added together to create the total score. With a higher score indicating severity.

INTERVENTION (# IN THE GROUP): 123

COMPARISON (# IN THE GROUP):

- Other Contact Sports: 69
- Non-Contact Sports: 97
- No Sports Participation: 118

FOLLOW UP PERIOD: Not applicable

RESULTS:

- Football participation resulted in more individuals with >3 concussions compared to other contact sports, non-contact sports, or no sports participation (30% vs 17%, 12%, 6%, respectively; *P*=.004).
- Football participation did not impact depression levels compared to those who did not play sports (mean 5.6 vs 5.1, respectively; *P*=.37).
- Football participation did not impact the rate of anxiety compared to those who did not play sports (20% vs 25%, respectively; *P*=.54).
- Football participation did not impact suicide rates compared to those who did not play sports (3.6% vs 8.2%, respectively; *P*=.079).

LIMITATIONS:

- The study was survey-based, which increases risk of reporting bias.
- The survey was advertised as investigating CTE (Chronic Traumatic Encephalopathy) and those who perceived themselves to be at a higher risk were more likely to participate in the study.
- Previous concussions and injuries were self-reported and could not be verified.

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A Low Glycemic Load Diet in Women with PCOS Helps Regulate Hunger Hormones

Changes in Ghrelin and Glucagon following a Low Glycemic Load Diet in Women with PCOS

Hoover SE, Gower BA, Cedillo YE, Chandler-Laney PC, Deemer SE, Goss AM. Changes in Ghrelin and Glucagon following a Low Glycemic Load Diet in Women with PCOS. *J Clin Endocrinol Metab*. 2021; 106(5):e2151-e2161. doi:10.1210/clinem/dgab028

KEY TAKEAWAY: A low glycemic load meal was associated with lower postprandial ghrelin and higher fasting and postprandial glucagon when compared to high glycemic load meals among women with PCOS.

STUDY DESIGN: Randomized crossover, controlled feeding design

LEVEL OF EVIDENCE: STEP 2

BRIEF BACKGROUND INFORMATION: Polycystic Ovarian Syndrome (PCOS) affects over 10% of premenopausal women and is associated with metabolic disturbances that increase susceptibility to obesity and difficulty with weight maintenance. An elevated fasting level of the "hunger hormone", ghrelin, is often found in women with PCOS and has been linked to lower postprandial satiety and higher postprandial hunger. The purpose of this study is to determine if a low glycemic load diet, compared with a high glycemic load diet, decreases ghrelin levels in women with PCOS.

PATIENTS: Women with PCOS

INTERVENTION: Low glycemic load (GL) diet

CONTROL: High glycemic load diet

OUTCOME: Hunger

METHODS (BRIEF DESCRIPTION):

- The study included 30 women diagnosed with PCOS based on the National Institutes of Health 1990 Criteria, including (1) hyperandrogenism and/or hyperandrogenemia, (2) oligo-ovulation, and (3) the exclusion of any existing disorders such as Cushing's syndrome, hyperprolactinemia, or congenital (nonclassical) adrenal hyperplasia.
- Participants were randomly associated to one of two eucaloric diets (high GL vs low GL) with food provided by the UAB clinical research unit several times a week and were weighed upon collecting meals. They were also instructed to maintain their baseline physical activity.
  - Low Glycemic Load: 41% Energy from CHO, 19% from protein, and 40% from fat; glycemic index ~50
  - High Glycemic Load: 55% energy from CHO, 18% from protein, and 27% from fat; glycemic index ~60
- Comprehensive metabolic testing was conducted before and after each eight-week arm, with a four-week washout period before changing diets.
- A solid meal test following a 12-hour fast was administered to each participant at the four-week midpoint of each diet arm to examine postprandial insulin, glucose, glucagon, ghrelin, and glucagon like peptide.
- During the solid meal, test blood samples were collected at 15 and 5 minutes prior to and 15, 60, 90, 120, 180 and 240 minutes after beginning meal consumption (time "zero").

INTERVENTION (# IN THE GROUP): 27

COMPARISON (# IN THE GROUP): 27

FOLLOW UP PERIOD: 20 weeks

RESULTS:

- Ghrelin was higher after the high GL meal than after the low GL meal at hours three and four after meal initiation (776 vs 711, respectively; *P*=.009).
- Glucagon was higher after the low GL meal than after the high GL meal (69 vs 63, respectively; *P*<.001).
- When comparing the high GL diet to low GL respectively, the following hormones were significantly affected by time post-meal, but not diet:
  - GLP-1 (3.5 vs 2.3, respectively; *P*<.001)
  - Cortisol (11 vs 9.4, respectively; *P*<.001)
  - Glucose (98 vs 85, respectively; *P*<.001)
  - Insulin (28 vs 29, respectively; *P*<.001)
- When comparing high GL diet to low GL diet respectively, the following were significantly affected by time post-meal, but not diet:
  - Hunger (36 vs 35, respectively; *P*<.001)
  - Desire to eat (39 vs 38, respectively; *P*<.001)
  - Fullness (54 vs 52, respectively; *P*<.001)

LIMITATIONS:

- Small sample size
- Absence of 30-minute time point for meal comparison

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