

The Female Athlete Triad: An Assessment of Current Practices in Primary Care and Benefit of Educational Intervention

Dana Brewington, M.D.¹, Derrick Johnson, M.D.², Mark Stovak, M.D.³, A.T. Harvey, Ph.D.⁴

¹Central Family Medicine, Warrensburg, MO

²Rocky Mountain Clinic and Saint James Healthcare, Butte, MT

³University of Kansas School of Medicine-Wichita Department of Family and Community
Medicine, Sports Medicine Fellowship at Via Christi Health

⁴Via Christi Hospitals Wichita, Inc., Via Christi Research, Wichita, KS

Abstract

Background. The Female Athlete Triad (Triad) is characterized by negative energy balance, disordered menstrual cycles, and low bone mineral density. The understanding and practices of primary care physicians (PCPs) regarding the Triad and the benefit of an educational intervention were assessed.

Methods. PCPs attending a regional conference were surveyed prior to, immediately after, and three months following the plenary lecture on the Triad. Surveys included knowledge about the components, diagnostics, treatment, clinician practice, and comfort level with regard to the Triad.

Results. The pre-test survey was completed by 84 of 126 (67%) attendees. The lecture increased from 53% to 98% the proportion of PCPs who identified the three domains of the Triad. Knowledge scores improved over the course of the lecture (from 3.4 to 5.1, $p < 0.05$), particularly regarding Triad components (effect size = 1.2) and treatment (effect size = 1.6) with only small gains in diagnostic knowledge (effect size = 0.1 to 0.3). The three-month follow-up survey, completed by only seven clinicians (8%), suggested good retention of knowledge though little practice changes.

Conclusions. A 50-minute educational session improved knowledge about the Triad. Particular improvement was noted in understanding the underlying etiology and treatment.

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Introduction

The Female Athlete Triad (Triad) is characterized by negative energy balance, disordered menstrual cycles, and low bone mineral density (BMD).¹ Energy intake insufficient to support energy expenditure forms the basis for this multifaceted syndrome. Negative energy balance can predispose a female athlete to hormonal dysfunction, manifesting as menstrual irregularities and loss of bone mass. Left untreated, the Triad can have dangerous and irreversible consequences: once bone mass is lost, or if peak BMD is never gained, bone

density may be inadequate to prevent future fragility fractures.

The Triad was first described in response to the clinical observation of an increase in stress fractures and amenorrhea seen in otherwise young healthy women athletes. The resulting 1997 position statement from the American College of Sports Medicine (ACSM) defined the Triad as the “interrelated components (of) disordered eating, amenorrhea, and osteoporosis,” noting that “alone or in combination, Female Athlete Triad disorders can decrease

physical performance and cause morbidity and mortality.”² Subsequent prevalence studies reported that no more than 5% of female athletes had all three pathological components.³⁻⁵ In 2007, the ACSM updated its position statement¹ and redefined the domains as energy availability, menstrual dysfunction, bone health. These changes gave less emphasis to the pathological extremes of each spectrum and reflected a growing appreciation for the interrelationship among the three domains of the Triad and the need to intervene prior to developing such significant pathology.

Disorders of the elements of the Triad are common in female athletes. Two large well-controlled trials have diagnosed clinical eating disorders in 31% (vs 5.5% of controls)⁶ and 42% (vs 9% of controls)⁷ of elite female athletes in leanness-dependent and weight-dependent sports. In a study of 163 female high school athletes, 37% incurred lost-time musculoskeletal injuries.⁸ Injury status was associated with BMD below that expected for age. In women with a BMD z-score of less than or equal to -2.0, the musculoskeletal injuries occurred in conjunction with oligomenorrhea or amenorrhea and disordered eating. Even in girls with normal bone density (BMD z-scores ≥ -1.0), musculoskeletal injury was associated with oligomenorrhea or amenorrhea in the preceding year.

Given that approximately half of exercising women experience subtle menstrual disturbances on a hormonal level⁹ and that menstrual irregularities have been found to be a better indicator of bone loss than intensity of training among runners,¹⁰ the potential for serious sequelae is substantial. Although athletes, coaches, and even physicians may recognize that menstrual irregularities are common in athletes, they fail to address these as pathologic phenomena that require medical attention.¹¹

Most clinicians have a poor understanding of the Triad. A 2006 survey of health care and athletic providers found that 48% of the physicians could identify all three (conservatively defined) components of the Triad correctly and only 9% stated they felt comfortable with treatment options.¹² In 2007, the American College of Sports Medicine (ACSM) updated its position statement to reflect a growing appreciation for the interrelationship among the three domains of the Triad with less emphasis on the pathological extremes of each spectrum (i.e., eating disorders, amenorrhea, and osteoporosis).¹ A survey completed after publication of the revised criteria showed an increasing knowledge gap with only 29% of physician respondents able to identify all three components of the Triad correctly.¹³ Inadequate energy intake, the basis for the syndrome, was the least recognized of the three and was noted by 36% of participants.

Education of physicians and improved awareness about the Triad among health care providers may lead to earlier identification of negative energy balance and a higher comfort level with initiating appropriate intervention before dangerous consequences ensue. Primary care physicians (PCPs) are in a unique position to detect subtle abnormalities and direct appropriate care early in the progression of the Triad. Recognition, treatment, and prevention should become a priority among primary care health care providers.¹ This investigation assessed whether a 50-minute educational intervention would improve awareness and impact clinical practice in encounters with physically active female patients of childbearing age.

Methods

This was a prospective, comparative (pre-post) assessment of a sample of clinicians attending a plenary lecture on the

Triad delivered to a state-wide meeting of PCPs. The rationale for selecting this meeting was that its attendees represented about 5% of PCPs in the state, one that leads the nation in training Family Medicine physicians, thus making their knowledge and practice relevant. Further, the educational lecturer was a nationally recognized leader in the area of the Triad and chair of the writing committee for the current consensus statement.¹ Objectives of the lecture were to help attendees recognize and participate in management of women with the Triad. The study was approved by the Institutional Review Boards of Via Christi Hospitals Wichita, Inc. and University of Kansas School of Medicine-Wichita.

Paper surveys developed by the investigators were distributed to participants in registration packets at the beginning of the conference. Pre-test surveys were completed and returned to conference staff prior to the lecture and post-test surveys immediately following the lecture. Respondents willing to provide contact information and complete a three-month follow-up were surveyed via electronic mail to assess retention of information and changes in clinical practice. Surveys were anonymous but coded to allow for within-subject comparisons.

The pre-test survey included six questions to allow identification of PCPs who treat active, reproductive-age women and five questions addressed clinicians' practice and comfort asking patients about the Triad. Surveys (see Appendix) contained questions about the Triad: one on its components, four on diagnostics, and two on treatment. Finally, pre-test and three-month surveys asked which, if any, of five screening questions clinicians routinely ask their pre-menopausal females.

Awareness of the three components of the Triad was assessed with the open-ended

question, "What are the three components of the Female Athlete Triad?" Responses were classified first by domain; correct answers were required to fall within one of three liberally interpreted domains of energy availability, reproductive health, and skeletal health. Second, answers within each domain were evaluated for how strictly the participant defined each aspect of the Triad. The most acceptable answers used the broadest and most up-to-date language reflecting understanding that each of the Triad components falls along a spectrum beginning with subtle abnormalities not necessarily meeting criteria for any specific diagnosis. The weakest answers reflected older and narrower definitions of the Triad, usually a diagnosis in itself: a symptom (e.g., amenorrhea) or extreme presentation (e.g., osteoporosis). Finally, the order of responses was evaluated to determine which domain came most readily to mind.

Diagnostic knowledge was addressed with multiple choice questions on: (1) risk factors for stress fracture (correct: hypothalamic amenorrhea, low BMD, severe undernutrition; incorrect: polycystic ovary syndrome); (2) indications for BMD testing (correct: history of multiple stress fractures, amenorrhea and disordered eating for six months, or a six-month history of oligomenorrhea and a low impact fracture; incorrect: missing menses while taking oral contraceptives); (3) sports carrying the higher risk for the Triad (correct: cheer-leading; incorrect: softball, basketball, volleyball); and (4) the z-score included in the definition of low BMD (correct: -1 to -2).

Treatment knowledge was addressed with multiple choice questions on: (1) the first step in treatment (correct: prescribing increased energy intake and/or decreased energy expenditure with observation; incorrect: watchful waiting or any use of an oral contraceptive), and (2) recommended

treatment team members (correct: physician, registered dietician, mental health provider, endocrinologist).

An overall knowledge score was derived using a seven-point scale. One point was given for correctly identifying the three domains of the Triad, one point each for the four diagnostic questions, and one point each for the two treatment questions.

Power calculations indicated that a sample of 40 matched tests (with $r = .2$) provided 80% power at a one-tailed alpha of .05 to detect an increase in knowledge score of "medium" effect size.¹⁴ Assuming 50% participation in the follow-up survey at three-months, a correlation coefficient of $r = .6$ would allow detection of a medium-sized increase in impact on clinical practice.

Descriptive statistics were used to characterize respondents, their training, and current practice. Knowledge scores were described using Cohen's effect sizes.¹⁴ Paired t-tests were used to compare knowledge scores at $p < 0.05$ (two-tailed). Impact on practice was assessed with paired t-tests comparing the number of screening questions asked prior to the lecture and at three-months.

Results

The pre-test survey was completed by 84/126 attendees (response rate 67%). Clinicians who were not PCPs were excluded prior to analysis as well as PCPs who performed neither pre-participation physicals (PPEs) nor well-woman exams, leaving 70 PCPs (69 family physicians and 1 pediatrician). Paired pre-post surveys were available from 58 of the 70 (83%). Twenty of 54 physicians (35%) reported having had formal training on the Triad either in medical school, residency, or through continuing medical education.

Current practice and comfort level. A minority of PCPs, 30%, reported screening specifically for the Triad at PPEs; 19%

recalled having diagnosed the Triad. Only 11% asked physically active pre-menopausal women about the Triad; the most common reason given for not asking was a lack of knowledge of "good guidelines for doing so" (see Table 1).

Table 1. Reasons given by physicians who do not always ask about the Female Athlete Triad.*

Response (n)	Reason
21	Don't know of any good guidelines for doing so.
9	Don't think about it.
5	Don't have time during visit.
5	Don't know what the Triad is.
3	Can tell from menstrual history, BMI, history of fractures.
1	Don't feel it will change any clinical outcome.

*Results were taken from 42 of 48 PCPs who perform both pre-participation exams and well-woman exams but do not always screen for the Triad.

Most PCPs reported routinely asking their active pre-menopausal females about history of bone injuries (63%), general eating habits (63%), and changes in menstrual cycles with increased activity (60%). Fewer asked about decreased body weight when participating in sports (30%) and whether calorie intake is increased with increased activity (30%). A slight majority of PCPs (56%) was comfortable asking about the Triad; fewer were comfortable referring a patient with the Triad to a specialist (36%), diagnosing the Triad (29%), or treating the Triad (16%).

Knowledge of Triad components. The proportion of PCPs who identified the three domains of the Triad increased from 53% to

98%. Improvement was noted in all domains: from 67% to 100% in energy availability, from 79% to 100% in repro-

ductive health, and from 67% to 98% in skeletal health (see Table 2).

Table 2. Components of the Triad reported PCPs before and after lecture, by domain (n = 58).

			Before		After	
DOMAIN	LEVEL	TYPICAL RESPONSES	n	%	n	%
Energy Availability		Missing	19	33	0	0
	Spectrum	Spectrum of energy availability, BMI, energy, nutrition, weight, diet	3	5	4	7
	Symptom	Weight loss, nutritional deficiencies, decreased eating, disordered eating, low BMI, low energy availability	23	40	40	69
	Extreme	Anorexia, eating disorder	13	22	14	24
Reproductive Health		Missing	12	21	0	0
	Spectrum	Menses, menstrual function	2	3	3	5
	Symptom	Anovulation, altered menses, menstrual disorders, menstrual irregularity	4	7	11	19
	Extreme	Amenorrhea, missed periods	40	69	44	76
Skeletal Health		Missing	19	33	1	2
	Spectrum	Bone density, bone strength	0	0	3	5
	Symptom	Decreased bone density, osteopenia, stress fractures	24	41	23	40
	Extreme	Osteoporosis	15	26	31	53

The extreme manifestation of amenorrhea was the most common component named in any domain, representing 80% of valid reproductive health responses before and 71% after the lecture. The domain most commonly listed first among the components of the Triad was reproductive health (59%) prior to and energy availability (59%) following the lecture. Based on an “ideal” causal order of low energy availability leading to decreased reproductive health with subsequent impact on skeletal health, domains ideally were ordered by three respondents before and 25 after the lecture.

Knowledge of Triad diagnostics. Improvements over the course of the lecture were seen in correct identification of: (1) the overall set of stress fracture risks (from 59% to 69%); (2) the set of indications for BMD testing (from 48% to 53%); (3) sport with the highest risk (from 28% to 47%); and (4) the z-score defining low BMD (from 72% to 83%).

Knowledge of Triad treatment. There was improvement, from 43% to 97%, in knowledge that the initial treatment to be prescribed is increased energy intake and/or decreased energy expenditure with observation. Inclusion of an endocrinologist on

the treatment team increased from 36% to 59%.

Overall Knowledge Score. A paired t-test indicated a statistically significant improvement in knowledge score from pre- to post-test (from 3.4 to 5.1, $p < 0.05$). As

shown in Table 3, large gains were made in knowledge of the Triad components (effect size = 1.2) and treatment (effect size = 1.6). Diagnostic knowledge items showed only small gains (effect size = 0.1 to 0.3).

Table 3. Scores on knowledge questions before and after the lecture (n = 58).

	Before Lecture		After lecture		Effect Size	p
	Mean (SD)		Mean (SD)			
Knowledge						
Named three domains of the Triad	0.53	(0.50)	0.98	(0.13)	1.2*	< .05
Diagnosis	2.07	(1.06)	2.52	(0.92)	0.6	< .05
Knew risk factors for stress fracture	0.59	(0.50)	0.69	(0.47)	0.3	
Knew indications for BMD testing	0.48	(0.50)	0.53	(0.50)	0.1	
Knew cheerleading only higher risk sport	0.28	(0.45)	0.47	(0.50)	3.5*	
Knew z-score for low BMD	0.72	(0.45)	0.83	(0.38)	0.3	
Treatment	0.79	(0.67)	1.59	(0.50)	1.6*	< .05
Knew first step in treatment	0.43	(0.50)	0.97	(0.18)	1.5*	
Included four clinicians on treatment team	0.36	(0.49)	0.62	(0.49)	6.3*	
Total Score	3.40	(1.54)	5.09	(0.96)	1.6*	< .05

*Large effect sizes in **bold**.

Retention and impact on practice. Though contact information for three-month follow-up was provided by 38 PCPs, only seven valid surveys were returned for assessment. Knowledge scores at three months averaged 5.0 (SD = 0.8) indicating that most knowledge had been retained. As an indicator of practice change, the mean number of assessment questions asked of active pre-menopausal females increased from 2.7 (SD = 1.9) to 3.1 (SD = 2.0); this difference was small (effect size = 0.2) and not statistically significant ($p = .68$).

Discussion

Gains in understanding of diagnostics related to the Triad were modest. Following the lecture, only half of the respondents provided correct answers to two of the four diagnostic questions. This may reflect a tendency for clinicians to focus on strong signs rather than appreciating the risk associated with subtle signs. Consistent with this line of thinking, rather than reflecting the spectrum-based definition of the Triad outlined in the 2007 consensus, the majority of responses in the domains of reproductive

health and in skeletal health (amenorrhea and osteoporosis, respectively) after the lecture continued to reflect the older definition involving extreme manifestations of the spectrum. No evidence indicated that this was a function of year of medical training. Recognition of risk has not been aided by studies reporting an incidence of the Triad of only 1.2% at the high school level,⁵ 2.7% in college athletes,³ and 4.3% in elite athletes.⁴ Such studies have been limited by reliance on self-reported data and the use of conservative definitions (e.g., disordered eating, amenorrhea, and osteoporosis) of Triad domains, each of which represents a spectrum ranging from physiologic homeostasis to frank disorder and disease. If Triad components are recognized only when extreme manifestations are present, the window of opportunity for early intervention may be missed by PCPs.

Our results were consistent with previous studies in that they supported the current ACSM stand that awareness about the Triad is lacking among PCPs. Our respondents appeared better informed than those in similar surveys conducted before¹² and after¹³ the current ACSM position paper¹ due perhaps to our acceptance of any legitimate mention of the domain rather than requiring more conservatively defined components.

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A strength of our investigation was that the educational lecture was given by a nationally recognized leader in the area of the Triad and chair of the writing committee for the current consensus statement.¹ In addition, our pre-test response rate of 67% provided a reasonable assessment of baseline understanding. Participants represented a variety of practice settings and patient populations, increasing the ability to generalize results.

Our study was limited by low response rate on the follow-up survey, which made evaluation of the impact of education on change in clinical practice difficult to assess. Further, responses describing "usual practice" were limited by the nature of self-reported data. Also, while the survey was created to be brief, a longer and more detailed survey may have increased sensitivity. Another limitation was that anonymity could not be preserved in the follow-up; response rates on retention may have been higher had an option for completing it with complete anonymity been available.

Further research is needed to determine the prevalence of the Triad and its sub-syndromal components as currently defined to establish the magnitude of the problem and increase its saliency for PCPs.

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Appendix
Female Athlete Triad - Pre-Test

A. Demographics:

A.1. What is your medical training background?

- A) Medical Student
- B) Resident
- C) Attending Physician
- D) Physician Assistant
- F) Nurse Practitioner
- G) Other _____

A.2. What is your specialty?

- A) Family Medicine
- B) Pediatrics
- C) OB/GYN
- D) Orthopedics
- E) Other _____

A.3. If you have graduated from medical school, in what year? _____

A.4. Have you had any formal training/education in your medical education involving the Female Athlete Triad?

- A) Yes
- B) No

If Yes Where? (Medical School, Residency, CME) _____

A.5. Do you perform pre-participation physical exams for female athletes?

- A) Yes
- B) No

A.6. Do you perform well woman exams on pre-menopausal females?

- A) Yes
- B) No

B. Knowledge of Female Athlete Triad Definition:

B.1. What are the three components of the female athlete triad?

- A)
- B)
- C)

C. Diagnosis of Female Athlete Triad:

- C.1. Which of the following increase the risk of stress fractures? (Mark all that apply.)
- A) Polycystic ovarian syndrome
 - B) Hypothalamic amenorrhea
 - C) Low bone mineral density
 - D) Severe undernutrition
- C.2. Bone mineral density testing should be done in which of the following? (Mark all that apply.)
- A) An athlete who missed three consecutive menses while on oral contraception
 - B) An athlete with a history of multiple stress fractures
 - C) An athlete with amenorrhea and disordered eating for six months
 - D) An athlete with a six month history of oligomenorrhea and a low impact fracture
- C.3. In which of the following sports would participation have a higher risk of female athlete triad?
- A) Softball
 - B) Basketball
 - C) Volleyball
 - D) Cheerleading
- C.4. Low bone mineral density is defined by the American College of Sports Medicine as having a history of nutritional deficiencies, hypoestrogenism, stress fractures, and/or other secondary clinical risk factors for fracture along with a bone mineral density Z-score of
- A) 1 to 0
 - B) 0 to -1
 - C) -1 to -2
 - D) -2 to -3
 - E) less than -3
- C.5. Which of the following do you ask your active pre-menopausal females about routinely? (mark all that apply)
- A) Does your weight drop when participating in sports?
 - B) Do you increase your caloric intake with increased activity?
 - C) Does your menstrual cycle change with increased activity?
 - D) Do you have a history of any bone injuries?
 - E) Questions on general eating habits

D. Treatment of Female Athlete Triad

D.1. The first step in treatment in an athlete with amenorrhea secondary to female athlete triad should be to:

- A) Start patient on oral contraception and observe.
- B) Observe until after season, if the cycle does not normalize treat at that time.
- C) Instruct to increase energy intake and/or decrease energy expenditure and observe.
- D) Start patient on oral contraception and instruct to increase energy intake or decrease energy expenditure and observe.
- E) Start patient on oral contraception, bisphosphonate, and increase energy intake or decrease energy expenditure.

D.2. Consensus recommendation is that athletes with an eating disorder and female athlete triad should have a multidisciplinary treatment approach and should include: (circle all that apply)

- A) Physician
- B) Registered Dietitian
- C) Mental Health Practitioner
- D) Endocrinologist

E. Practice Preferences on Inquiring/Screening for Female Athlete Triad:

E.1. Do you screen for the female athlete triad on pre-participation physical exams?

- A) Yes
- B) No

E.2. Do you recall having made the diagnosis of female athlete triad in a patient?

- A) Yes
- B) No

E.3. Do you ask about the female athlete triad on physically active pre-menopausal women you see?

- A) Yes
- B) No

E.4. If you do not always ask about the female athlete triad list any reasons for not doing so, please describe.

- A) Don't feel it will change any clinical outcome
- B) Don't know of any good guidelines for doing so
- C) Don't have time during visit
- D) Other (please list) _____

E.5. Comfort level with the female athlete triad. (Mark all that apply)

- A) I am comfortable asking about the female athlete triad
- B) I am comfortable diagnosing the female athlete triad
- C) I am comfortable treating patients with the female athlete triad
- D) I am comfortable referring a patient out with the female athlete triad

Predicting the Importance of Hospital Chaplain Care in a Trauma Population

Gina M. Berg, Ph.D.^{1,2}, Robin E. Crowe, M.A.², Shannon Borchert, M.Div.¹,
Jane Siebert, R.Ph., M.A.C.M.¹, Felecia Lee, M.A.²

¹Wesley Medical Center, Wichita, KS

²KU School of Medicine-Wichita, Department of Preventive Medicine and Public Health

Abstract

Background. The purpose of this exploratory study was to determine if the importance of chaplain care is associated with and could be predicted by patient or injury characteristics.

Methods. A telephone survey of recently discharged trauma patients was conducted. Logistic regression analyses were conducted to determine what factors are associated with the importance of chaplain care and satisfaction with chaplain care.

Results. Self-reported religious affiliation was associated with the importance of chaplain care and importance of chaplain care was associated with satisfaction with chaplain care.

Conclusions. The value of chaplain care cannot be measured by patient characteristics, therefore, chaplain care should be offered to all patients and families.

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Introduction

A positive relationship between spirituality and religiosity and favorable health outcome has been noted in the literature.¹⁻³ Patients of varying health statuses, but especially in end of life situations,⁴ want their healthcare team to acknowledge and discuss their spirituality.⁵ Patients want providers to have an awareness of their spirituality or religiosity and an acknowledgement of its importance at varying levels from inquiry about beliefs to praying with the patient.⁶ Furthermore, healthcare providers also believe that discussing spirituality and religiosity is an important part of patient care.^{6,7} In a review of a clinical pastoral care program adapted for clinicians, Todres, Catlin, and Thiel⁸ found that program participants gained a new awareness of the importance of recognizing the spiritual or religious component of patient care.

Spirituality or religiosity is used as a coping strategy for patients and their families when facing illness, injury, or end-of-life issues.^{9,10} In addition, spirituality was an important component in the healing pro-

cess after a traumatic injury.¹¹ Trauma patients and their families may experience greater need for spiritual care, as the injuries and complications unique to this population may involve end-of-life issues. O’Gorman¹² stated that end-of-life care should involve strategies for maintaining information including a patient’s spiritual care arrangements. Similarly, Gries, Curtis, Wall, and Engelberg¹³ found that after making end-of-life decisions, family members’ satisfaction was associated with a discussion of the families’ spiritual needs.

Ehman et al.⁵ researched whether patients want physicians to inquire about religious and spiritual beliefs if becoming very ill. Fifty-one percent of the patients in this study described themselves as religious and 90% believed that prayer may sometimes influence recovery. Nearly half reported that religious beliefs would influence their medical decisions if they become very ill. Ninety-four percent of individuals with such beliefs agreed or strongly agreed that physicians should ask them whether they have such beliefs if they

become very ill. Also, 44% percent of the respondents who denied having such beliefs also agreed that physicians should ask about them.

The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) requires that health care agencies provide adequate spiritual care.¹⁴ Hospital chaplains often are called upon to contact family members, act as a liaison between trauma staff and the patient's family, provide emotional/spiritual support during the resuscitation and/or recovery period, and meet religious or culturally specific needs.¹⁵

In our level I trauma center, chaplains are members of the trauma team and called to all traumas. During initial resuscitation, the chaplain begins a spiritual assessment from the information being conveyed by emergency personnel. The chaplain gathers specific information regarding injury, the condition of the patient, and other information that will be pertinent to the spiritual care of the patient and/or their family. Following initial assessment, the greatest need is to support the trauma patient's family by easing stress, providing resources to assist families, and providing updates while families wait to visit with their loved one that is being cared for by the trauma team. The goal is to provide an atmosphere of compassion.

In a trauma resuscitation event, often no information other than demographics are available for the patient.¹⁶ The relationship between demographics and desire for spiritual or religious services is scarce in the literature. Older adults believed that a higher power supports them, that prayer could heal them from both physical and mental illness, and that a higher power works through the mundane world. The findings suggested that religious beliefs significantly influence the psychological well-being of older adults.

The purpose of this research was to investigate the importance of chaplain care

by patient and injury characteristics in a trauma population and to determine if those characteristics can be used to predict and triage chaplain care. Since the reported desire for spiritual and/or religious conversations increases at end of life and severe illness situations, it is expected that those patients with greater traumatic injury or higher stress will be correlated with a reported greater importance for chaplain care.

Methods

Participants. A prospective, cross-sectional study with telephone surveys of recently discharged level one (emergent) and level two (urgent) trauma patients admitted to a midwestern level I trauma center was designed. Patients were excluded if they were: unable to provide a phone number, non-English speaking, presented with severe mental illness, incarcerated, or the patient was deceased.

Materials. Survey questions included demographic items, self-reported stress level during trauma care, self-reported health before and after trauma care, satisfaction with trauma care, and satisfaction with hospital chaplain care. Importance of and satisfaction with hospital chaplain care initially were measured on a scale from 1 (strongly disagree) to 6 (strongly agree). Patient injury severity, as measured by the Injury Severity Score (ISS)¹⁷ and Glasgow Coma Scale¹⁸ were abstracted from patient medical record.

Procedures. Institutional Review Board approval was obtained. Patients or their representative gave informed consent for participation at the time of hospital discharge. Patients surveyed were age 18 or older. Family members were surveyed if the patient was age 17 or younger or unable to respond. Up to five calls were made and surveys were completed within four weeks of hospital discharge. Perceived inter-

personal care and perceived technical care were counterbalanced to reduce priming effects. Data collection last for one year, from October 2007 to October 2008. Injury severity¹⁷ and Glasgow Coma Scale¹⁸ scores were collected from the trauma registry post-consent.

Descriptive and modeling data analyses were conducted using PASW Version 18.¹⁹ Binary logistic regression was completed to determine which independent variables were statistically associated with the dependent variables: 1) importance of chaplain care (important and not important) and 2) satisfaction with chaplain care (not satisfied and satisfied). Statistical significance was defined as $p < 0.05$.

Results

Four hundred, thirty-five individuals consented to study participation of 1,724 level 1 and 2 trauma patients during the study period time (25.2%). Of those

consented, 278 completed the surveys for a response rate of 63.9%. There were 15 surveys excluded due to missing data, thus reported results reflect 263 participants. Demographic information is listed in Table 1; the sample proportionally represented the total trauma population during the study period. The majority of study respondents were white (91%) and male (56%), with a mean age of 44 years. The majority of respondents reported attending 'some' college or more (64%) and had a yearly household income of below forty thousand dollars (52%).

Most patients (90%) reported having a religious affiliation (e.g., Catholic, Christian non-Catholic, Jewish, Muslim, other) and over half rated chaplain care as important (61%). Correlation analyses (Table 2) revealed no significant association between importance of chaplain care and age, respondents' self-reported stress level, self-reported health before or after care,

Table 1. Demographic characteristics and importance of chaplain care in the study population.

	Total (n, %)	Important	Not Important	<i>p</i> (χ^2)
Total	263 (100)	161(61)	102(39)	
Sex				.39
Male	146 (56)	86	60	
Female	117 (44)	75	42	
Race				.34
White	216 (91)	135	81	
Non-white	22 (9)	16	6	
Education				.90
HS Graduate or less	93 (36)	57	36	
Some College or more	167 (64)	101	66	
Income				.33
Less than \$40k	124 (52)	73	51	
\$40k and over	117 (48)	76	41	
Pt Reported Religious Affiliation				0.022
Yes	223 (90)	143	80	
No	25 (10)	18	22	

N includes patients who directly responded to the survey (n=215, 81.7%) as well as respondents such as a spouse, parent, or other family member (n=48,18.3%).

Table 2. Clinical characteristics and importance of chaplain care (N = 263).

Respondent	Mean (SD)	p	r
Age	44 (16.5)	.43	0.05
Reported Stress Level ^a	4.7 (1.4)	.21	0.08
Reported Patient Health Before Care ^b	2.0 (1.5)	.40	0.05
Reported Patient Health After Care ^b	3.6 (1.6)	.97	0.00
Satisfaction with Trauma Care ^c	5.5 (1.0)	.002	0.14
Satisfaction with Chaplain Care ^c	5.3 (1.2)	< .001	0.37
Patient			
ISS ¹⁷	10.0 (7.6)	.85	0.01
GCS ¹⁸	14.4 (2.5)	.17	0.09

^a Stress Level Scale: 1(Not stressful) to 6 (Very stressful)

^b Health Before/After Scale: 1(No problems) to 6 (Chronic/continuing)

^c Satisfaction Scale: 1 (Very dissatisfied) to 6 (Very satisfied)

perceived or actual Injury Severity Score or Glasgow Coma Scale score. Importance of chaplain care was correlated with satisfaction with overall trauma care (r = .372, p < 0.001). Importance of chaplain care was also correlated with satisfaction with chaplain care (r = .136, p = 0.03).

Factors Associated with Chaplain Care.

A logistic regression analysis was conducted using age, income, Injury Severity Scores, and religious affiliation as predictor variables to examine the importance of Chaplain Care to patients. The only factor

independently associated with the criterion was religious affiliation (p < 0.01). Individuals that identified as Catholic (AOR 13.43, 95% CI, 3.62 - 49.91, p < .001) and those that identified as Christian (AOR 3.773, 95% CI, 1.43 - 9.93, p < .01) were more likely to agree with the importance with Chaplain Care compared to individuals who identified as none. There was, however, no difference between those who identified as having no religious affiliation and those who identified other as their religious affiliation (Table 3).

Table 3. Logistic regression predicting importance of chaplain care.

Predictor	B	Wald χ^2	p	Odds Ratio	CI
Age	-0.173	0.307	0.58	0.841	0.46 - 1.55
Income	0.356	1.299	0.25	1.427	0.77 - 2.63
Injury Severity Score*		0.101	0.99		
9-15	0.074	0.044	0.84	1.077	0.54 - 2.17
16-24	-0.006	0	0.99	0.994	0.41 - 2.42
>=25	0.158	0.067	0.80	1.171	0.35 - 3.90
Religious Affiliation**		15.254	0.00		
Catholic	2.598	15.045	> .001	13.423	3.62 - 49.91
Christian	1.328	7.23	0.01	3.773	1.43 - 9.93
Other	0.994	1.236	0.27	2.702	0.47 - 15.59

*Reference group is ISS category 0-8. **Reference group are those that identify no religious affiliation.

A second logistic regression analysis was conducted using age, income, Injury Severity Scores, gender and the importance of Chaplain Care to the patient as predictor variables in order to examine whether patients were satisfied with their Chaplain Care. Only importance of chaplain care was

independently associated with the criterion variable (AOR 5.64, 95% CI, 1.43 - 22.31, $p < 0.05$). The patients who disagreed that Chaplain Care was important were 5 times more likely to be dissatisfied with their Chaplain Care (Table 4).

Table 4. Logistic regression predicting satisfaction of chaplain care.

<i>Predictor</i>	<i>B</i>	Wald χ^2	<i>p</i>	Odds Ratio	CI
Age	0.763	1.023	0.31	2.144	0.49 - 9.40
Income	-0.612	0.719	0.40	0.543	0.13 - 2.23
Injury Severity Score*		0.125	0.99		
9-15	0.344	0.074	0.79	1.410	0.12 - 16.85
16-24	0.463	0.124	0.73	1.589	0.12 - 20.97
≥ 25	19.586	0.000	0.99	320	0.00
Gender	-1.889	2.830	0.93	0.151	1.43 - 22.31
Importance of Chaplain Care	-1.73	6.078	0.01	5.640	0.20 - 1.37

*Reference group is ISS category 0-8.

Discussion

This study sought to determine if demographic and injury characteristics, which is often the only information readily available to the trauma team, were associated with and could predict patients' value of importance on chaplain care. Regression results did not demonstrate a relationship between importance of chaplain care and patient or injury characteristics which are often the only known information about the patient.

Further, it was expected that higher reported stress levels (as might be expected in more severe injuries) would be related to greater value of chaplain care, however, this was not the case. Thus, the injury severity as measured by clinical (ISS) as well as psychological (self-reported stress) parameters were not good indicators of patients' value of chaplain care. Only reported religious affiliation was associated with importance of chaplain care in this study. Those that identified as being Catholic or

Christian were more likely than those that identified as other or no religious affiliation to agree with the importance with chaplain care. However, since religious values may not be known during resuscitative efforts, this piece of information may not be useful when determining the need for chaplain care during immediate care.

In a situation in which chaplain care resources may be scarce, decision schematics for appropriate triage of chaplain services should be considered. At the time of trauma resuscitation, only demographic and injury severity information is known about the patient. Often religious information is not available at the time of need. If chaplain resources, in fact, are scarce, these results did not support the development of a triage decision scheme based on the patient's demographic or injury characteristics and further research is necessary to determine criteria for need within a trauma population or entire hospital population to best utilize

hospital chaplain care. Since spiritual care for the patient is a JCAHO requirement,¹⁴ it is valuable to understand what patient characteristics were associated with chaplain care value to serve the unique needs of trauma patients and their families properly and promptly.

As expected the importance of chaplain care was related to satisfaction with chaplain care. Often chaplains, as in our institution, provide a variety of care beyond specific religious or spiritual services, such as communication with the family. When spiritual or religious care givers are valued by patients, it may be reassuring to have them be a source of communication and liaison assistance.

The ability to generalize this information is limited. It was completed in the Midwest and represents a narrow demographic sample as there was a high reporting of religious affiliation. The survey was

conducted after discharge and may not reflect the patients' stress of the trauma resuscitation event accurately.

Conclusions

These findings reinforced the value of the hospital chaplain in the care of trauma patients and suggest chaplain care was most important to those with an already established faith foundation. The importance of chaplain care was not distinguished by demographic or injury characteristics, thus a triage decision schematic is not recommended using these parameters. Those who rated chaplain care as not important might still find value in simply being aware that these services are available to them and their families. An evaluation of what specific chaplain services patients and their families value might direct institutions toward a cost effective usage of the resources chaplains provide.

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Fatigue and TSH Levels in Hypothyroid Patients

Boutros El-Haddad, M.D.¹, Issam El Bizri, M.D.², K. James Kallail, Ph.D.¹,
Rosalee E. Zackula, M.A.³, and Jan M. Hoffman, M.D.^{1,4}

¹University of Kansas School of Medicine-Wichita Department of Internal Medicine

²Huggins Hospital, Wolfeboro, NH

³University of Kansas School of Medicine-Wichita Office of Research

⁴Via Christi Clinic Center for Diabetes and Endocrinology, Wichita, KS

Abstract

Background. Fatigue is often the complaint that initiates thyroid function investigation. Most available data related to fatigue and hypothyroidism involved patients with subclinical hypothyroidism where fatigue was not the primary outcome. This study investigated the association between TSH levels and fatigue and if there was a target TSH interval that was associated with lower incidence of fatigue in patients with hypothyroidism.

Methods. An analytic, retrospective cohort study design assessed the relationship between TSH levels and fatigue. All adult patients at one endocrinology clinic who were diagnosed with hypothyroidism between January 1, 2006 and December 31, 2007 were included. Diagnoses were confirmed by biochemical testing. Data were abstracted from the clinic's electronic medical record. Fatigue status was self-reported by the subject during examination by the endocrinologist. Fatigue status and TSH levels were obtained twice: at diagnosis and during the first follow-up visit.

Results. A total of 135 patients met the inclusion criteria. After treatment, all patients had reductions in TSH levels. Those subjects reporting relief from fatigue tended to be males ($p = 0.003$), had lower TSH levels at follow-up ($p < 0.001$), had larger TSH differences from baseline ($p = 0.007$), and had a primary diagnosis of acquired hypothyroidism ($p < 0.001$). Females were 2.9 times more likely to report persistent fatigue than males. Patients with primary diagnosis of thyroiditis were 3 times more likely to report persistent fatigue than those with acquired hypothyroidism.

Conclusions. The observed relief from fatigue after treatment correlated with a higher TSH reduction compared to patients with persistent fatigue. It was unclear if fatigue relief was related to the level of TSH reduction (TSH difference) or to a lower absolute TSH level reached after treatment.

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Introduction

Hypothyroidism is a common condition affecting 4.6% of the US population.¹ Hypothyroidism manifests different levels of severity and presents with a wide inter-individual range of clinical and biochemical signs and symptoms.² Most of the clinical manifestations of hypothyroidism are related to the lack of thyroid hormone. The lack of thyroid hormone results in a generalized slowing of metabolic processes leading to

fatigue, cold intolerance, weight gain, generalized slowing, and bradycardia.^{3,4}

Advances and improvements in the diagnosis of hypothyroidism have meant that a larger number of patients are being detected with the condition.⁵ Endocrinologists titrate thyroid hormone replacement based on thyroid stimulating hormone (TSH) levels. Despite the improvement in laboratory diagnosis, follow-up, and

monitoring, patient's satisfaction has not improved.⁶

Fatigue and obesity are often the complaints that initiates thyroid function investigation.^{3,4} Fatigue is reported in 21% of patient encounters in primary care.⁷ Testing in the fatigued patient is increasing, although the yield is low, particularly with thyroid testing. Fatigue poses a diagnostic challenge for clinicians with its extensive differential diagnosis. Fatigue symptoms usually begin long before presentation and often remain after treatment. Thyroid function testing is recommended only when symptoms of fatigue are prolonged and debilitating.⁴

Most available data related to fatigue and hypothyroidism involved patients with subclinical hypothyroidism where fatigue was not the primary outcome.^{2,8,9} For example, symptoms, including fatigue, in patients with subclinical hypothyroidism improved with hormone replacement.² Two clinical scores assessing symptoms and signs of hypothyroidism (Billewicz and Zulewski scores) improved significantly. However, no specific interval or target for the TSH level was suggested as a result of these scores. Another randomized trial concluded that there were no clinically relevant benefits from six months of thyroxine treatment in women with mild subclinical hypothyroidism.²

The aim of treatment for hypothyroidism is to restore the patient's TSH value to normal. Some patients may feel better only when their TSH level below 2.5 mU/l, the lower half of the reference range.⁴ In fact, quality of life measures (including fatigue) are reduced distinctly in thyroid cancer patients undergoing thyroid hormone withdrawal.¹⁰ Thus, low TSH levels are important for symptom reduction in hypothyroid patients. However, the target TSH that may improve symptoms of fatigue is unclear.

The purpose of this study was to investigate the association between TSH levels and fatigue and to investigate if there is a target TSH range that was associated with lower incidence of fatigue in patients with hypothyroidism. The research question was: Is there an association between fatigue and TSH levels in patients with hypothyroidism on hormonal replacement therapy? It was hypothesized that a specific range of TSH will be associated with less fatigue.

Methods

Study design. An analytic, retrospective cohort study design was used to assess the relationship between TSH levels and fatigue. The study was approved by the university Institutional Review Board.

Setting and data source. The study took place at an endocrinology clinic in Wichita, Kansas. Clinic staff provided names of all adult patients who were diagnosed with a type of hypothyroidism (by JH) between January 1, 2006 and December 31, 2007. One investigator (IEB) reviewed charts of eligible participants and diagnoses were confirmed by biochemical testing. Data were abstracted from the clinic's electronic medical record.

Participants. Eligible participants were adult clinic patients, aged 18 or over, with diagnoses of primary hypothyroidism according to the International Classification of Diseases, 9th Revision (ICD-9). Specifically, clinic staff identified patients with the following ICD-9 codes: 244: Acquired hypothyroidism (Ablation), 245: Thyroiditis (Autoimmune) and 244.9: Unspecified hypothyroidism (NOS). Inclusion criteria were: a) documented reported fatigue prior to treatment, b) documented fatigue status at three-month follow-up, c) hormone replacement therapy, and d) record of TSH levels from both initial and three-month follow-up visits. Exclusion

criteria were: a) patients with other known causes for fatigue at the time of diagnosis (i.e., cancer, including thyroid cancer, uncontrolled diabetes, sleep apnea, advanced chronic obstructive pulmonary disease, fibromyalgia, clinical depression, among others), b) patients on T3 (liothyronine), and c) those who obtained biochemical testing at other facilities.

Variables. The outcome of interest was fatigue status following hormone replacement therapy. Fatigue status was self-reported as present or absent by the subject during examination and interview by the endocrinologist. Fatigue status and TSH levels were obtained twice: at diagnosis (baseline) and during the first follow-up visit, usually at 3 months (post-treatment). Fatigue status was identified as those patients reporting fatigue at follow-up (Persistent Fatigue) and those reporting no fatigue (Relief from Fatigue). In an effort to control for information bias associated with self-reported fatigue, only those patients with a documented complaint of fatigue prior to treatment were included in the analyses. Reduction in TSH level was calculated by subtracting follow-up levels from baseline (TSH difference). Predictor variables were age, body mass index (BMI), and TSH difference. Potential confounders/effect modifiers (i.e., sex, type of primary diagnosis, and BMI by TSH difference interaction) were assessed with multi-variable analysis.

Statistical methods. Sample size was determined by the number of patients in the clinic who met inclusion/exclusion criteria during the study period. Quantitative variables (age, BMI, and TSH difference) were assessed for normality, while categorical variables were summarized by frequency and/or proportions. Descriptive analysis was conducted for patient characteristics and TSH level at baseline and at follow-up. Univariate analyses (Kolmo-

gorov-Smirnov, Chi-square or Fisher's Exact Test, risk estimates, Mann-Whitney Test) were conducted to compare Persistent Fatigue with Relief from Fatigue groups. Logistic regression models (Generalized Linear Models: binomial probability distribution with logit link function) that incorporated TSH difference, including interactions, were explored. Criteria for best model was based on goodness-of-fit measures [i.e., Deviance (closest value to one), AIC, and BIC (small-is-better form)]. Analyses were conducted in PASW Statistics 18 (SPSS), IBM Corp., Somers, NY.

Results

Eligible participants included 183 patients identified with one of the three types of hypothyroidism. Of those, 135 (74%) met the inclusion criteria and were included in the final analysis. Table 1 summarizes patient demographics, TSH levels, diagnoses, and univariate analyses by fatigue status. Data were sparse and test results of the continuous variables (age, BMI, TSH levels) by Fatigue Status using the Kolmogorov-Smirnov tests were inconclusive. However, histograms revealed a potential non-Gaussian distribution, therefore, non-parametric Mann-Whitney exact tests were conducted. Likewise, Fisher's exact tests were reported for gender and diagnosis. Results showed significant differences for gender, TSH follow-up, TSH difference, and diagnosis.

Those subjects reporting relief from fatigue tended to be males more so than females ($p = 0.003$), had lower TSH levels at follow-up ($p < 0.001$), had larger TSH difference ($p = 0.007$), and had a primary diagnosis of post ablative hypothyroidism ($p < 0.001$). Crude risk estimates showed that females were 2.9 times more likely to report persistent fatigue than males. Similarly, patients with primary diagnosis of

Table 1. Characteristics of adults with hypothyroidism presenting with fatigue.

	Relief from Fatigue	Persistent Fatigue		
Gender (%)	n = 87	n = 48	p	RR _{crude}
Female	58 (66.7)	43 (89.6)	0.003	2.9
Male	29 (33.3)	5 (10.4)		ref
Diagnosis (%)				
Acquired (post ablation) Hypothyroidism	69 (79.3)	18 (37.5)	< 0.001	ref
Thyroiditis	18 (20.7)	30 (62.5)		3.0
Unspecified Hypothyroidism	--	--		
Median (range)				
Age	51.0 (33, 74)	54.5 (32.0, 73.0)	0.793	
BMI	27.0 (19.0, 36.0)	28.0 (19.0, 36.0)	0.33	
TSH baseline	10.8 (6.2, 16.0)	10.4 (6.2, 14.8)	0.971	
TSH follow-up	1.0 (0.5, 7.4)	1.85 (0.3, 8.6)	< 0.001	
TSH difference	9.5 (3.2, 14.6)	7.9 (2.6, 13.7)	0.007	

thyroiditis were three times more likely to report persistent fatigue than those with post ablative hypothyroidism. The conflicting results for gender by diagnosis by fatigue status were interesting, such that, of the 30 females diagnosed with thyroiditis, 90% reported persistent fatigue, whereas of the 18 males with thyroiditis, 83.3% reported relief from fatigue, although data were sparse.

Figure 1 demonstrates the relationship between fatigue status and TSH levels at baseline and follow-up, with regard to primary diagnosis. With the exception of two female patients (top: age 46 with BMI = 21, bottom: age 63, BMI = 34), a linear (and lower) trend was observed for relief from fatigue compared with persistent fatigue.

Table 2 shows results from the final Generalized Linear Model. Goodness of fit measures were Deviance = 1.434, AIC = 129.76, BIC = 141.38, with gender, diagnosis, and TSH difference included in the model. All were statistically significant.

Greater reductions in TSH level were associated with relief from fatigue, while controlling for the effects of gender and diagnosis (RR_{adj} = 1.22, $p = 0.033$). In addition, results showed that patients diagnosed with acquired (post ablation) hypothyroidism were more than 14 times as likely to report relief from fatigue than those diagnosed with thyroiditis.

More than 51% of patients were diagnosed with acquired hypothyroidism (69 out of 135, and of these 55 were female); moreover, the greatest reduction in TSH levels, as measured by median TSH difference, were observed within this group (see Figure 2).

Discussion

The study showed that thyroid hormonal replacement was associated with improvement in reported fatigue in the majority of patients. This observation was expected, as most of the symptoms of hypothyroidism are related to thyroid hormone deficiency.

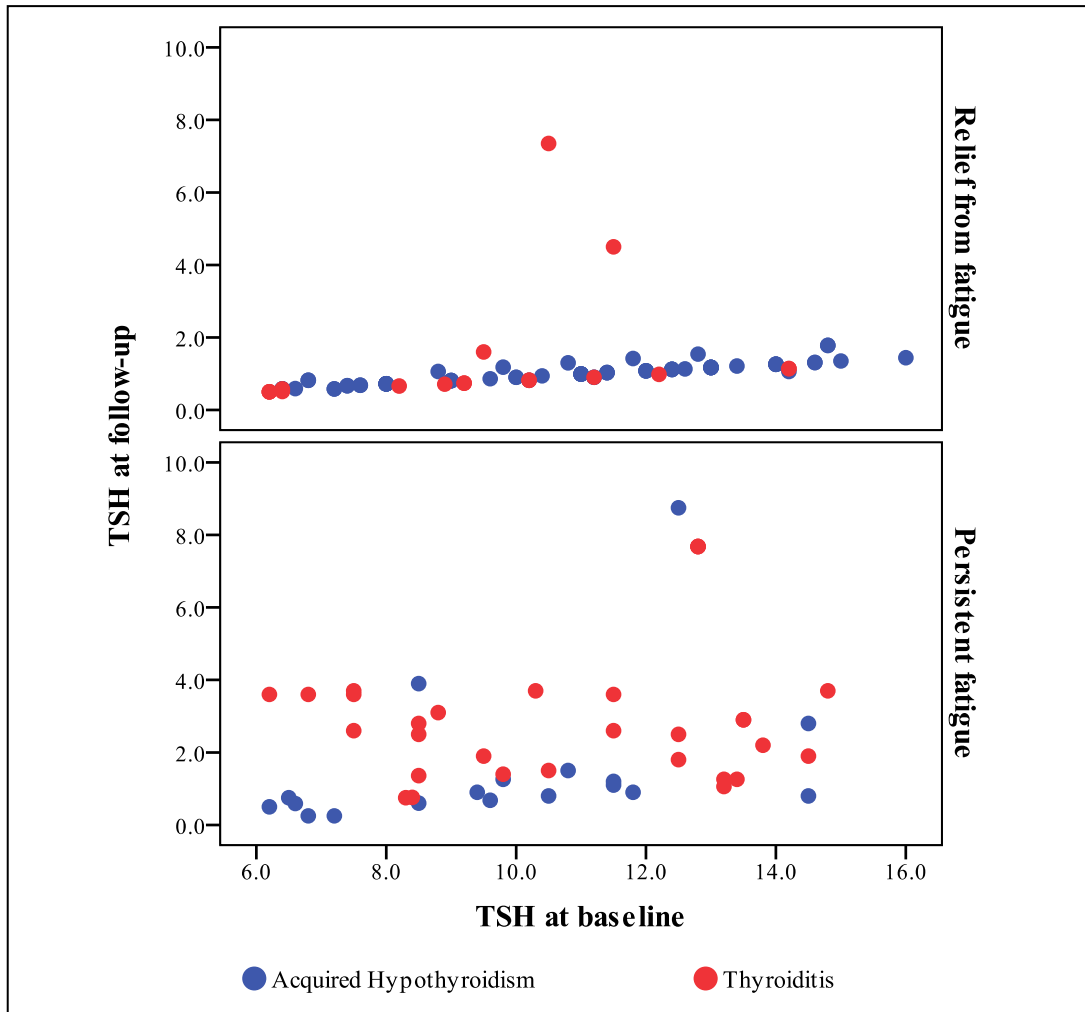


Figure 1. Relationship between fatigue status, TSH levels, and diagnosis.

Table 2. Multivariable logistic regression analysis of relief from fatigue compared with persistent fatigue adjusted for gender diagnosis and reduction in TSH level (TSH difference).

	RR _{adj}	p	95% Wald CI	
			Lower	Upper
Gender				
Female	0.05	< 0.001	0.01	0.22
Male	ref			
Diagnosis				
Ablation	14.09	< 0.001	4.73	42.00
Autoimmune	ref			
TSH difference	1.22	0.033	1.02	1.46

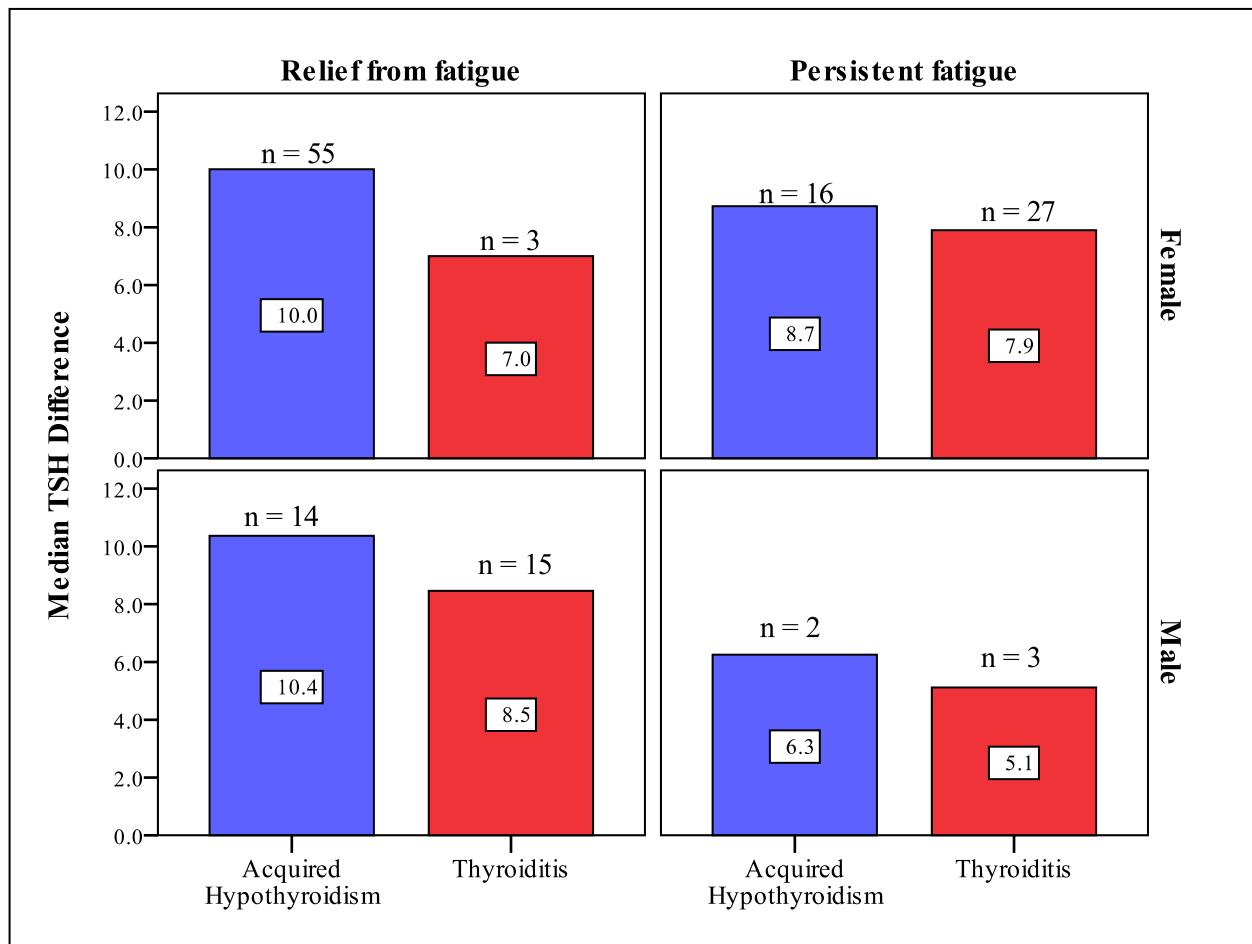


Figure 2. Fatigue status by gender, diagnosis, and median TSH difference.

Despite treatment and the decrease of TSH value, fatigue persisted in a number of patients. Interestingly, the observed relief from fatigue after treatment correlated with a higher TSH reduction compared to patients with persistent fatigue. This observation may be related to presence of a higher concentration of thyroid hormone in patients reporting improvement in fatigue, thereby resulting in more inhibition of TSH secretion. It was unclear if fatigue relief was related to the level of TSH reduction (TSH difference) or to a lower absolute TSH level reached after treatment.

In addition, patients with autoimmune thyroiditis were less likely to report improvement of fatigue compared to the

post ablation group. The observed variability of response to treatment between patients with thyroiditis and patients with post ablation hypothyroidism could be related to the association of autoimmune thyroiditis to other autoimmune disorders that may have been clinically silent. However, groups were imbalanced and data were sparse. More than 51% of patients were diagnosed with acquired (post ablation) hypothyroidism (69 out of 135, and of these 55 were female); moreover, the greatest reduction in TSH levels, as measured by median TSH difference, were observed within this group (see Figure 2). Thus, evaluating interactions among variables were not statistically feasible.

These results were limited in several ways. Data were obtained from one endocrinology clinic by one endocrinologist. Initial TSH levels differed widely. Fatigue was self-reported and no validated measure of fatigue was used. Fatigue was assessed only at diagnosis and the three-month follow-up. A longer follow-up is needed to assess the effect of thyroid hormonal replacement therapy on fatigue.

Despite these limitations, the study results are interesting. It showed variable

response to treatment by gender and by diagnosis. It is possible that female patients and patients with a diagnosis of thyroiditis are less likely to respond to conventional treatment and require a higher dose of thyroid hormonal replacement therapy. The study was not designed to answer this question. Future studies should consider a prospective cohort design that match patients on diagnosis type, then reassess the effects of gender and TSH levels on various levels of fatigue.

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Keywords: hypothyroidism, fatigue, endocrinology



CASE REPORT

hCG Induced Hyperthyroidism Due to a Metastatic Germ Cell Tumor

Hammad Hussain, M.D.¹,
Leigh M. Eck, M.D.²

¹Quincy Medical Group, Quincy, IL

²University of Kansas Medical Center,
Department of Medicine, Division of
Endocrinology and Metabolism
Kansas City, KS

Introduction

Testicular cancer is a relatively rare cancer with an estimated 8,290 new cases diagnosed annually in the US.¹ Germ cell carcinomas comprise the overwhelming majority (98.9%) of adult testicular carcinomas.² Ninety-five percent of germ cell tumors (GCTs) occur in the gonads and the rest occur in extragonadal tissues.³

Germ cell tumors are divided into seminomatous or non-seminomatous types.⁴ Non-seminomatous germ cell tumors (NSGCT) may be composed of embryonal carcinoma, teratoma, choriocarcinoma, or yolk sac tumors. Ninety percent of non-seminomatous tumors express either alpha-fetoprotein or human chorionic gonadotropin (hCG).⁵ Intact hCG consists of two subunits. The α subunit is identical to the α subunit of the pituitary gonadotrophins and thyroid-stimulating hormone (TSH). The β subunit is unique to hCG, but strongly resembles the β subunit of luteinizing hormone (LH). Beta-hCG levels are an important tool in the diagnosis and monitoring of treatment of NSGCT. Studies in animals and humans showed that hCG can activate the TSH receptor when present in excess and induce thyrotoxicosis.^{6,7} More than 40% of patients with beta-hCG in excess of 50,000 U/L have biochemical hyperthyroidism.⁸

We report a male patient presenting with metastatic extragonadal germ cell tumor (EGCT) who developed thyrotoxicosis.

Case Report

A 38-year-old male, without significant past medical history, presented with complaints of shortness of breath, hemoptysis, and night sweats of two-month duration. A chest x-ray showed diffuse pulmonary nodules confirmed on a subsequent chest computed tomography (CT) scan. In addition, an anterior mediastinal mass was identified on CT. A CT guided biopsy of the anterior mediastinal mass was performed. Based on the morphology and immune profile, this mass was classified as NSGCT with a predominant choriocarcinoma component. Staging revealed metastases to the brain, liver, spleen, and kidney. Testicular ultrasound did not reveal any masses, thus making the diagnosis of an extragonadal germ cell tumor (EGCT). A serum beta-hCG level was found to be greater than 200,000 U/L.

During this hospital admission in which chemotherapy was initiated, the patient developed persistent tachycardia and fever. In light of his known elevated beta-hCG level, a diagnosis of paraneoplastic hyperthyroidism with impending thyroid storm was entertained. Thyroid testing revealed a TSH of 0.071 mcu/mL (0.35-5.0), total T3 of 231 ng/dL (80-180), and a free thyroxine level of 3.0 ng/dL (0.6-1.6). Although the patient's thyrotoxicosis was suspected to be related to hCG induced hyperthyroidism, additional testing was undertaken to rule out an autoimmune etiology of thyrotoxicosis,

including measurement of thyroid peroxidase antibodies (TPO) and thyroid stimulating immunoglobulins (TSI). Both TPO and TSI testing were normal thus ruling out Hashimoto's thyrotoxicosis and Grave's hyperthyroidism as potential etiologies. Radioactive iodine uptake and scanning was not pursued due to recent iodine loading with CT contrast material.

Due to symptomatic hyperthyroidism, the patient was initiated on anti-thyroid medication and propranolol. He received two cycles of a chemotherapeutic regimen including ifosfamide, paclitaxel, and cisplatin. Within days of initiating chemotherapy, his symptoms of thyrotoxicosis resolved and his free thyroxine normalized. His anti-thyroid medication and propranolol were rapidly tapered off. His beta-HCG level dropped to 148,047 U/L after the first cycle of chemotherapy and eventually to a nadir of 401 U/L. Upon review of serial values of β -HCG, free thyroxine, and TSH measurements, there was an obvious improvement in thyroid laboratory testing with decreasing β -hCG levels (see Figure 1). Unfortunately, the patient had further oncologic disease progression with poor response to additional cycles of cisplatin based chemotherapy. He expired within eight months of initial diagnosis.

Discussion

Paraneoplastic hyperthyroidism can occur in non-seminomatous germ cell tumors due to the choriocarcinoma component of these tumors which produces hCG. hCG has thyroid stimulating activity in animals as well as humans.⁹ In patients with NSGCT, the prevalence of hyperthyroidism in a large cohort study was 3.5%.¹⁰ Within this same cohort, the prevalence of hyperthyroidism increased to 50% in patients with high serum hCG levels at presentation (>50,000 IU/L).¹⁰ Not all patients with significantly elevated hCG levels develop hyperthyroidism; this is

thought to be related to the existence of hCG variants with different isoforms having different thyroid stimulating activity.^{9,11} Another potential explanation for the disparate development of paraneoplastic hyperthyroidism may be the presence of polymorphisms of the TSH receptor gene, resulting in increased sensitivity of the TSH receptor to hCG.¹²

hCG induced hyperthyroidism has been reported more commonly in women.¹³ Gestational transient thyrotoxicosis can be seen in women with high serum concentration of hCG during early pregnancy leading to hyperthyroidism characterized by elevated serum free thyroxine concentrations and low serum TSH concentrations. hCG related hyperthyroidism can be seen in women with gestational trophoblastic disease (GTD); the development of hyperthyroidism in this population is influenced largely by the level of hCG as well.¹⁴

Standardized recommendations for treatment of hCG induced hyperthyroidism in patients with testicular cancer do not exist.¹⁵ Patients with symptomatic hyperthyroidism are treated with β adrenergic receptor antagonist therapy and/or anti-thyroid drugs.¹⁶ Anti-thyroid medications are an efficacious adjuvant treatment in hCG induced hyperthyroidism since hormone synthesis occurs within the thyroid gland. However, hyperthyroidism in hCG secreting malignant disease represents a paraneoplastic syndrome, therefore, the definitive treatment is treatment of the cancer.

Conclusion

hCG induced hyperthyroidism in GCTs can be overlooked as the signs and symptoms of hyperthyroidism may be attributed to the underlying malignancy and treatment of the same. In patients with NSGCT and hCG levels greater than 50,000, screening for thyroid dysfunction should be undertaken given the high prevalence of paraneoplastic

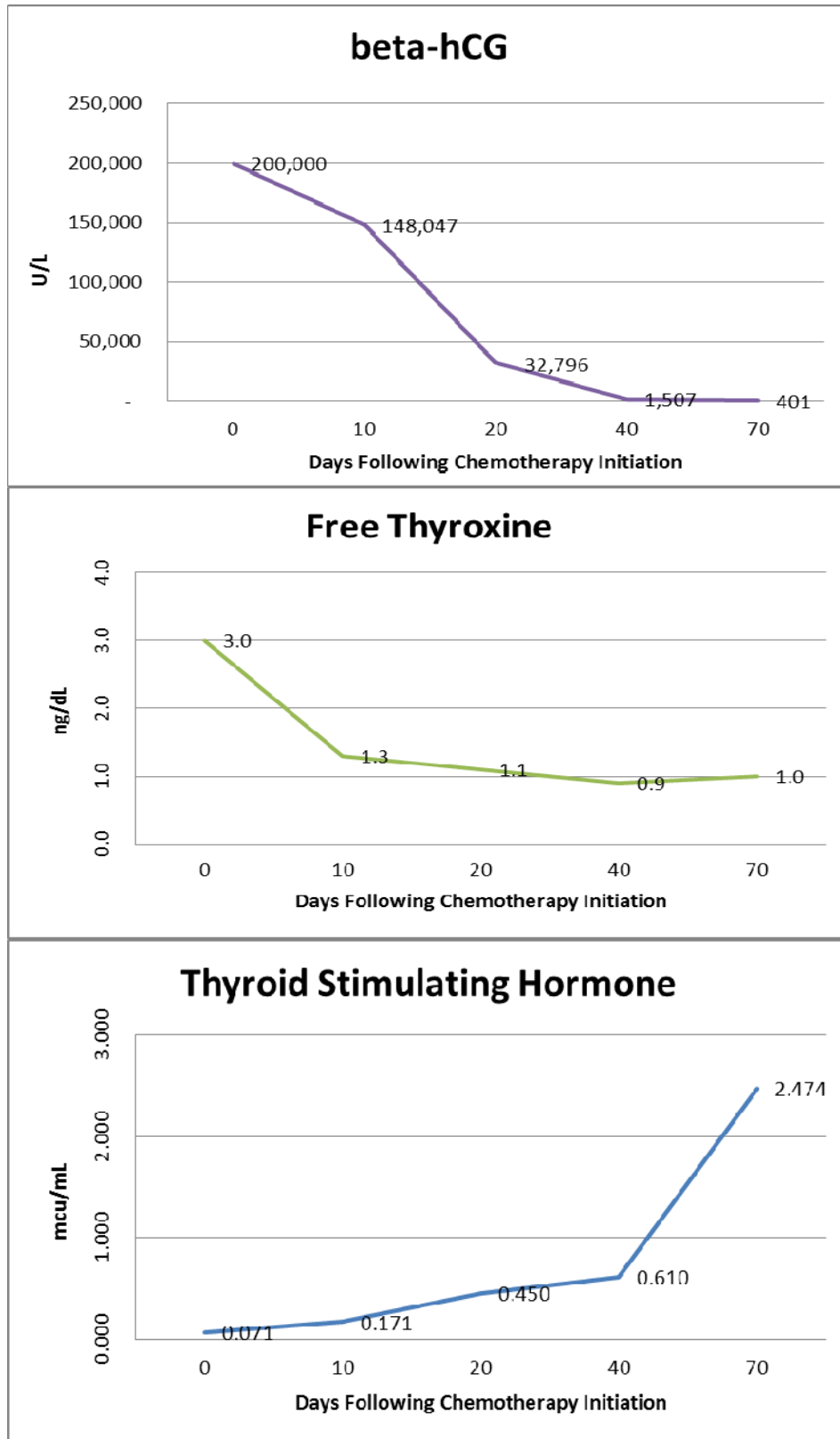


Figure 1. β -HCG, free thyroxine, and TSH measurements over time.

hyperthyroidism in this cohort. Paraneoplastic hyperthyroidism can be managed with anti-thyroid medications as well as symptomatic therapy with β -adrenergic receptor antagonists. However, definitive treatment lies in treating the underlying malignancy.

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Keywords: hyperthyroidism, thyrotoxicosis, testicular neoplasms, germ cell tumor, human chorionic gonadotrophin



CASE REPORT

Bilateral Adrenal Hemorrhage after Blunt Abdominal Trauma

Vanessa L. Voge, M.D.¹

Bruce W. Thomas, D.O.^{1,2}

¹Department of Surgery

University of Kansas

School of Medicine-Wichita

²Division of Trauma

Via Christi Hospital on St. Francis

Wichita, KS

Introduction

Adrenal insufficiency associated with bilateral adrenal hemorrhage after blunt torso trauma is uncommon and may not be suspected as a cause of hemodynamic instability in a patient with multi-system trauma. Without appropriate treatment, acute adrenal failure is associated with major complications and death.

Only a few cases of bilateral adrenal hemorrhage after blunt trauma have been reported.¹⁻⁴ We present a patient who suffered multiple injuries in a motor vehicle collision, including bilateral adrenal hemorrhage. The patient's injuries resulted in adrenal insufficiency, which required steroid supplementation.

Case Report

A 52-year-old male was evaluated at an American College of Surgeons-verified level 1 trauma center after suffering injuries in a motor vehicle collision. On presentation, the patient had a Glasgow Coma Scale Score of 3T (i.e., no eye opening, no verbal response, no motor response, and intubated), a blood pressure of 126/114 mmHg, and a heart rate of 111 bpm. The patient underwent computed tomography (CT) of the head, cervical spine, chest, abdomen, and pelvis. These radiographic studies revealed bilateral adrenal injury (Figure 1), a splenic laceration (Figure 2), left renal laceration, a lung contusion, rib fractures, cerebral intraparen-

chymal and subarachnoid hemorrhages, a condyle fracture of the first cervical vertebrae, and pubic rami fractures.

The patient underwent splenic embolization, which was unsuccessful. The patient subsequently underwent emergent exploratory laparotomy and splenectomy. Despite surgical control of intraabdominal bleeding and aggressive resuscitation with crystalloids and blood transfusions, the patient remained hemodynamically unstable. An adrenocorticotrophic hormone (ACTH; cosyntropin) stimulation test was performed due to suspected adrenal insufficiency and the results were consistent with that diagnosis. The patient was treated with hydrocortisone and fludrocortisone. The patient's blood pressure stabilized after the first dose of intravenous steroids.

The patient subsequently underwent tracheostomy and gastrostomy tube placement. Ten days after his initial presentation, a repeat cosyntropin test and a 24-hour urine cortisol level were obtained. The patient's cortisol level was 1 mcg/dL prior to the administration of cosyntropin and 8 mcg/dL after 60 minutes had elapsed, again consistent with adrenal insufficiency. Only trace amounts of cortisol were detected in the 24-hour urine collection. The patient remained on steroid supplementation at his discharge from the hospital to a long-term facility 10 days after his initial injuries.



Figure 1. Computed tomographic scan of the abdomen demonstrating bilateral adrenal hemorrhage.



Figure 2. Computed tomographic scan of the abdomen illustrating a splenic laceration.

Discussion

The incidence of adrenal hemorrhage in trauma patients is unknown because some adrenal injuries are asymptomatic and may remain undiagnosed. Retrospective evaluations of CT scans performed on patients with traumatic torso injuries showed an incidence of adrenal injuries of 1-3%, with

the right adrenal gland injured more often.² In a series of 1,120 patients who underwent CT for blunt abdominal trauma, adrenal hemorrhage was found in 20 patients (2%). The injuries were unilateral in 17 patients (12 right-sided and five left-sided) and bilateral in three patients (23 total adrenal injuries).

Rana et al.⁵ evaluated 2,692 trauma patients who underwent CT. Adrenal hematoma was detected in 51 patients (1.9%), with bilateral lesions occurring in three patients. In the pediatric trauma population, Sivit et al.⁶ reviewed 1,155 CT examinations and found adrenal hemorrhage in 34 patients (3%) with the majority of injuries to the right adrenal gland.

Diagnosing adrenal insufficiency in a patient who has suffered multiple injuries is difficult because the signs and symptoms are often nonspecific and coincide with what is seen with other traumatic injuries such as hypovolemia, closed head injuries, and spinal shock. The patient often presents with altered mental status, fever or hypothermia, and progressive hypotension that is often refractory to vasopressors.

The diagnosis of adrenal insufficiency is confirmed with laboratory testing. In normal subjects, serum cortisol concentrations are highest in the early morning, ranging from 10 to 20 mcg/dL. An early morning serum cortisol concentration less than 10 mcg/dL is suggestive of adrenal insufficiency. Adrenal insufficiency is diagnosed most often with a cosyntropin stimulation test. There are differing opinions on how to perform the ACTH stimulation test and the amount of ACTH to administer. To perform the standard high dose ACTH stimulation test, a baseline serum cortisol level is determined prior to the administration of 250 mcg of cosyntropin intravenously. A serum cortisol level is checked 30 minutes and 60 minutes after cosyntropin administration. A normal response would produce a cortisol level

greater or equal to 25 mcg/dL for critically ill, post-traumatic patients.⁷ Those who fail to demonstrate the appropriate response are diagnosed with adrenal insufficiency.

The imaging study used to diagnose adrenal hemorrhage is CT. Usually, adrenal hemorrhage is an incidental finding when a CT is ordered for other reasons. In the study by Burks et al.,² nineteen of the adrenal injuries (83%) appeared as discrete round to oval hematomas expanding the adrenal gland, while two (9%) appeared as diffuse irregular hemorrhage obliterating the gland, and two (9%) appeared as uniform swelling of the adrenal gland. Associated CT findings included "stranding" of the peri-adrenal fat caused by blood in 14 cases (61%) and posterior pararenal hemorrhage mimicking a thickened diaphragmatic crus in nine cases (39%).

In the study by Sivert et al.,⁶ all of the adrenal hemorrhages had decreased attenuation relative to the liver and spleen on contrast-enhanced CT and ipsilateral diaphragmatic crural thickening was a frequent (61%) associated finding. In a study by Sinelnikov et al.,⁸ the CT findings of adrenal trauma were: focal hematoma (30%), indistinct (27%) or enlarged (18%) adrenal gland, gross (15%) or focal (7%) adrenal hemorrhage, and adrenal mass (11%). Associated CT findings included peri-adrenal fat stranding (93%), retroperitoneal hemorrhage (22%), and thickened diaphragmatic crura (10%).

The primary treatment of adrenal insufficiency is steroid replacement with mineralocorticoid and glucocorticoid coverage. Hydrocortisone 100mg, intravenous, is administered every 6-8 hours and is adjusted to the stress level of the patient.⁷ It also is recommended to administer fludrocortisone for mineralocorticoid supplementation. The amount of steroid administered can be tapered as the patient responds and may be changed to an oral form when the patient is

tolerating enteral intake. The likelihood of regaining adrenal function after bilateral adrenal hemorrhage is uncertain. There are at least two reports of patients who have regained adrenal function after experiencing adrenocortical insufficiency following bilateral adrenal trauma.^{1,4} However, many patients require lifelong steroid replacement.

Our patient had not regained adrenal function 10 days after his traumatic injury and was discharged to a long-term care facility on steroid supplementation. It is uncertain if patients with bilateral adrenal hemorrhage will regain adrenal function, but testing for the return of adrenal function should be done so that patients do not remain on unnecessary, lifelong steroid use.

Conclusion

Although traumatic bilateral adrenal hemorrhage resulting in adrenal insufficiency is rare, it can be a significant cause of morbidity and mortality in critically injured patients. Evaluation for adrenal insufficiency should be undertaken when a critically injured patient remains hemodynamically unstable after the more common etiologies of hemodynamic instability have been excluded. Administration of steroids for adrenal insufficiency can be life-saving.

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- Keywords:* adrenal insufficiency, adrenal glands, hemorrhage, blunt injuries



CASE REPORT

West Nile Encephalitis

Sapna A. Shah-Haque, M.D., M.B.A.,
Elizabeth Rinehart, MS4,
Boutros El-Haddad, M.D.
University of Kansas
School of Medicine-Wichita
Department of Internal Medicine

Introduction

West Nile Virus (WNV) belongs to the family *Flaviviridae*^{1,4} and is related to Japanese encephalitis.^{4,5} The virus usually is spread via the *Culex* mosquito with humans being an incidental reservoir.^{4,6} It is a febrile illness, which is accompanied by “flu-like” or nonspecific symptoms. Most commonly, people present with myalgias, arthralgias, fever, and lymphadenopathy. More severely, it can present with, but not limited to nuchal rigidity, altered mental status, and personality changes.^{1,3,4}

WNV was identified first in 1937 in Uganda and since has been identified in parts of the Middle East and Asia.^{1,2,4} In the 1950s, it was seen in Egypt and Israel, and moved West, causing a major outbreak of encephalitis in Romania in the 1990s.^{3,4} It also has been seen in other parts of Europe and Asia including, but not limited to, France, Italy, and India.⁴ Before 1999, only four arboviruses had been endemic in the United States: St. Louis encephalitis, eastern equine encephalitis, western equine encephalitis, and La Crosse encephalitis.² WNV first was identified in the US during an outbreak in New York in 1999.^{2,7,8} It initially was identified in Kansas in 2002.⁹

A case of proven West Nile encephalitis is reported to illustrate the presentation of the viral encephalitis and to remind clinicians to keep it on their differential diagnosis.

Case Report

A 30-year-old Caucasian male known to have a history of seasonal allergy and well-controlled asthma was transferred to the hospital from an outlying facility because of increased confusion and agitation. One week prior to presentation, the patient complained of nonspecific myalgias that were attributed to recent strenuous outdoor activity or possibly the onset of a flu-like illness.

These symptoms were followed by a rash on his neck that was attributed to sun exposure and skin irritation. Over the next four days, the rash spread from the neck to include his back and arms. A week later, he reported a fever of 102° Fahrenheit, along with recurrent nausea and vomiting, new onset of lethargy, and generalized weakness. He was taken to the local emergency room for further evaluation and hospitalized. Due to increased agitation, the patient was transferred to our tertiary facility.

During transport, the patient was agitated and required sedation. He was obtunded and intubated to protect his airway. Supportive care was administered.

On physical examination, the patient was afebrile. He was responsive to pain although intubated and sedated. He did not exemplify nuchal rigidity. Both Kernig and Brudzinski signs were absent. He underwent a lumbar puncture and was started on doxycycline to cover for suspected tick-borne illness due to his history of outdoor hobbies and febrile illness with rash.

Analysis of cerebrospinal fluid (CSF) showed pleocytosis with $585/\text{mm}^3$ leukocytes of which 65% were lymphocytes and 29% were neutrophils. CSF glucose was within normal range at 54 mg/dl, but protein was elevated at 119 mg/dl, with serum glucose of 88 mg/dL and serum protein of 7.3 g/dL. Polymerase chain reaction (PCR) for Herpes Simplex Virus (HSV) and enteroviruses were negative. Human Immunodeficiency Virus (HIV) serology was negative.

Computed tomography (CT) without contrast and magnetic resonance imaging (MRI) with and without contrast showed normal anatomy. Immunoglobulin G (IgG) and immunoglobulin M (IgM) on the cerebrospinal fluid for West Nile virus were positive at a 1:2 dilution. Serum IgG and IgM for West Nile were positive at greater than 1:320 dilutions. The diagnosis of West Nile encephalitis was confirmed.

An infectious disease specialist was consulted. Doxycycline was discontinued and supportive care was recommended. The patient was extubated, but continued to be agitated and confused. The patient's agitation completely resolved prior to discharge, and he began to recall details of his illness prior to hospitalization. Although his confusion resolved, he had some difficulty recalling short term memory items. With the help of physical and occupational therapy, the patient began to regain strength. He was dismissed home with outpatient physical therapy to assist him with residual weakness.

Discussion

This case of WNV infection was transmitted more than likely via a mosquito, as human to human transmission is very rare, and the patient had no history of recent blood transfusion.¹⁰ Since 2003, the incidence of WNV has decreased. In the US, 386 cases of neuro-invasive WNV were reported, spanning from May through

October 2009.¹¹ From 2006-2008, the median number of confirmed cases of neuro-invasive WNV in Kansas was five per year.¹⁰ In each of 2009 and 2010, there were three neuro-invasive cases in Kansas.¹²

Most individuals who encounter WNV present with flu-like symptoms and usually have unsuspected, hence unreported, cases. Less than 1% of reported cases will have neurological manifestations of the virus,⁴ such as acute flaccid paralysis, headache, dyskinesias, confusion, agitation, or obtundation.^{4,13-16} Risk factors for more severe presentation of WNV include having comorbidities (i.e., diabetes mellitus or hypertension), prolonged steroid use, age 50 years or older, and immunocompromise.^{13,15} Initially presenting with severe illness does not correlate with poor prognosis.¹⁴ The diagnosis of WNV can be made with clinical suspicion and detection of IgM to the virus on CSF, serum, or tissue.^{13,15,16} The criteria to make the diagnosis of WN encephalitis are outlined in Table 1.

Differentiating WN encephalitis from WN meningitis can be challenging. Diagnostic criteria for both include fever, leukocytosis, and pleocytosis on CSF.¹⁴ However, with WN meningitis, the patient may exhibit nuchal rigidity, phonophobia, photophobia, and/or Kernig or Brudzinski sign. In addition, imaging may show findings consistent with acute meningeal inflammation, however, findings on imaging are not necessary to make the diagnosis.

In contrast with WN encephalitis, the patient may not show meningeal signs. The patient may show confusion, agitation, obtundation, irritability or, personality changes.¹⁴ Imaging of WN encephalitis may show acute inflammation without involving the meninges, suggesting a meningo-encephalitis. CT of the head rarely exhibits clinical findings, whereas an MRI may show enhancement of the periventricular area or the leptomeninges.^{15,16}

Table 1. The criteria to make the diagnosis of WN encephalitis.¹³

<p>Febrile illness with neurological manifestations (headache, aseptic meningitis, myelitis) plus at least one of the following:</p> <ol style="list-style-type: none"> 1. Isolation of WNV from tissue, blood, CSF, or other body fluids. 2. Demonstration of WN viral antigen or genomic sequence in tissue, blood, CSF, or other body fluids. 3. Demonstration of WN IgM antibody in acute CSF sampling using MAC-ELISA. 4. Demonstration of 4-fold change in PRNT antibody titer to WNV in paired, appropriately timed acute and convalescent serum samples. 5. Demonstration of WNV-specific IgM (by MAC-ELISA) and IgG (by ELISA or HI antibody titer, confirmed by PRNT) in a single serum sample.

CSF analysis in WN encephalitis may show pleocytosis with a predominance of lymphocytes that rarely exceeds 100 cells/microliter. Protein may be elevated and glucose usually is within normal range.¹⁶ Our patient's CSF analysis showed a lymphocyte predominant pleocytosis, but the cell count was greater than 100 cells/microliter. Protein was elevated and glucose was normal.

Unlike other encephalitic viruses, WN encephalitis patients usually have a good prognosis and do not manifest long-term side effects, though it may take time to recover with rehabilitation.^{4,14} The treatment of WN encephalitis usually is supportive care. Ribavirin has been used, but did not show any clinical significant benefit.^{4,13} Interferon alpha-2b has shown some promise in animal models, particularly when

combined with ribavirin. In regard to human treatment, further research is warranted.¹⁷

Conclusions

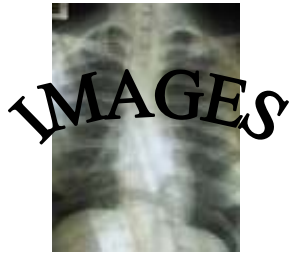
In conclusion, during the warmer months of the year, WNV should be included in the differential diagnoses when a patient presents with flu-like symptoms, especially in those with neurological changes. Our patient presented with nonspecific flu-like symptoms followed by generalized weakness and increased agitation. In light of the patient's neurological manifestations and other reported cases of WNV within the patient's state of residence, suspicion of WNV was high. WN IgM was isolated in the CSF as well as in the serum. The patient continued to improve and required only outpatient physical therapy on dismissal.

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Keywords: West Nile virus, encephalitis, flavivirus, case report



Endoscopy Ultrasound Imaging of an Abdominal Aortic Aneurysm

Karim R. Masri, M.D.

William J. Salyers, M.D.

University of Kansas School of Medicine-Wichita

Department of Internal Medicine

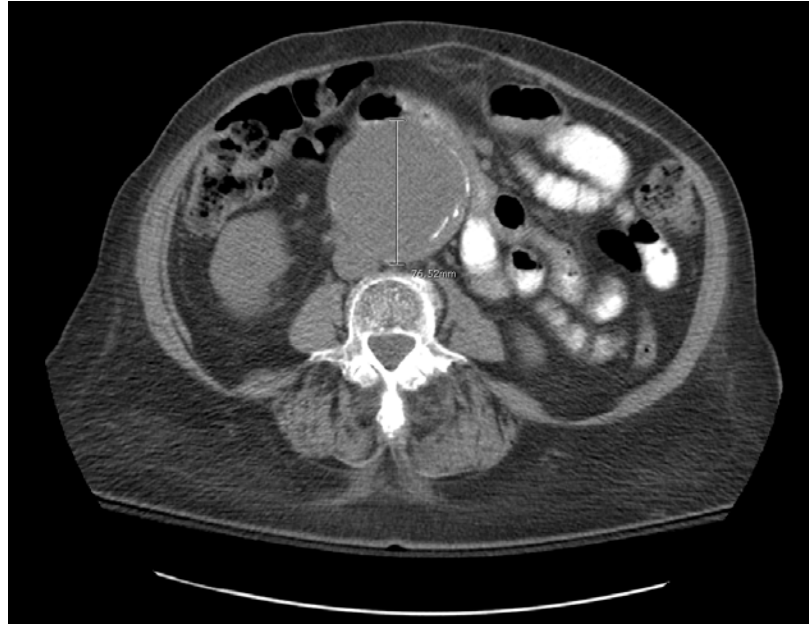


Figure 1. Computed tomography (CT) of an abdominal aortic aneurysm.



Figure 2. Endoscopic ultrasound (EUS) image of the patient's gall bladder and abdominal aortic aneurysm. Doppler is seen in right-side of image.

An 89-year-old white female presented with abnormal liver function tests and jaundice in a cholestatic pattern. CT revealed a large fusiform unruptured infrarenal abdominal aortic aneurysm (AAA) measuring 7.4 cm in maximal dimension (Figure 1) with no biliary splenic or pancreatic abnormalities. An ultrasound (US) of the liver showed mild common bile duct (CBD) dilation, up to 8 mm, with an ill-defined hypoechoic lesion measuring 1.4 x 1.9 x 0.7 cm on the pancreatic head not seen on CT. Magnetic resonance cholangiopancreatography (MRCP), completed after the US, showed no definite obstructive lesions in the vicinity of the liver or pancreas. The CBD was 7 mm and the AAA was noted.

Carbohydrate antigen (CA) 19-9 was elevated at 181 U/mL (< 55U/mL) while cytomegalovirus, herpes simplex virus, viral hepatitis, ceruloplasmin, anti-nuclear antibody, anti-mitochondrial antibody, anti-smooth muscle antibody were normal. CA 19-9 is a nonspecific tumor marker associated clinically in patients with suspected pancreatic malignancies, in particular intraductal papillary mucinous neoplasia.

In light of the US and CA-19-9 findings, the patient underwent EUS examination of the pancreas. A large cystic appearing lesion was seen on EUS near the duodenal bulb in the region of the head of the pancreas and measured 7.4 cm. Doppler ultrasound confirmed the area was vascular consistent with the known AAA. No parenchymal abnormalities were identified. Figure 2 shows a section of the patient's gallbladder in relation to her AAA. Images of an AAA relative to the gallbladder are uncommon in the literature.

EUS is an innovative tool in the field of diagnostic gastroenterology. It has combined the potential of CT imaging by layering pathology in situ and staging neoplasms. EUS identifies pancreatic lesions suggestive of malignancies. EUS findings representing malignancy include: 1) main pancreatic duct greater than or equal to 7 mm, 2) irregular and thick walled cystic lesion greater than 30 mm, and 3) mural nodules greater than 10 mm. Fine needle aspiration is done to identify cystic lesions in combination with tumor markers.¹⁻⁴

AAAs readily have been identified during EUS procedures. Varadarajulu et al.⁵ reported that out of 413 patients suspected of pancreatic-cystic lesions, four were aneurysms. Although AAAs are mostly infrarenal due to atherosclerosis buildup,⁶ they are not the most common kind of abdominal aneurysms. Splenic artery aneurysms are more prevalent.⁷

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Keywords: endosonography, abdominal aortic aneurysm, case report



CLINICAL QUIZ

Evaluation of a Submucosal Gastric Lesion

Karim R. Masri, M.D.

William J. Salyers, M.D.

KU School of Medicine-Wichita

Department of Internal Medicine

Wichita, KS

A 25-year-old black female presented to the gastroenterology clinic for evaluation of a submucosal gastric lesion. She had a computed tomography (CT) performed for evaluation of right lower quadrant pain and had a low density, well circumscribed, mildly exophytic appearing intramural lesion in the distal antrum along the greater curvature of the stomach measuring 2.6 cm x 2 cm x 2.2 cm (Figure 1). Esophagogastroduodenoscopy (EGD) revealed an extrinsic/subepithelial lesion (Figure 2) at the junction of the gastric body and antrum. She had no other complaints and denied gastrointestinal bleeding. She underwent an endoscopic ultrasound that showed a 3.01-cm x 1.35-cm cyst arising from the deep mucosal layer of the gastric antrum without involvement of the muscularis propria. Fine-needle aspiration drainage of a total of 8.5 mL of clear fluid was performed successfully. Additional sub-centimeter small cystic area within the submucosa adjacent to this cystic lesion was identified but was not accessed separately due to its small size (Figure 3). Cytology of fluid was nonmalignant. Carcinoembryonic antigen could not be performed due to viscosity of fluid. Fluid amylase was 433.



Figure 1. CT section of suspicious lesion.



Figure 2. EGD of suspicious lesion.



Figure 3. Endoscopic ultrasound of suspicion lesion.

What is the most likely diagnosis?

- A. Carcinoid
- B. Choledochal Cyst
- C. Gastric Carcinoma
- D. Gastric Duplication Cyst
- E. Gastrointestinal Stromal Tumor (GIST)
- F. Pancreatic Pseudocyst
- G. Zollinger-Ellison Tumor (Gastrinoma)

Correct Answer: D. Gastric Duplication Cyst

Gastric duplication cysts are rare congenital anomalies that form during early embryonic development. They are usually seen in the proximal gastrointestinal tract, most commonly in the proximal small bowel, stomach and esophagus. They may be communicating with the lumen or adjacent without luminal communication.^{1,2} They usually are identified during endoscopic ultrasound or CT imaging. They usually are asymptomatic, but rarely, may manifest as dysphagia, abdominal pain, and acute pancreatitis if near the ampulla of Vater.³ They are low risk for malignancy.⁴

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Keywords: gastrointestinal diseases, congenital abnormalities, cysts, endoscopic ultrasonography

Editor's Note



The following article, **Kansas Horse & Buggy Doctor Receives Letter from Albert Einstein**, by Jane F. Knapp, M.D. and Robert D. Schremmer, M.D., provides a glimpse into the history of medicine in Kansas. It was published originally in **Missouri Medicine**. We appreciate Dr. John Hagan, Editor of **Missouri Medicine**, for allowing the Kansas Journal of Medicine to reprint it.

PERSPECTIVE FEATURE

Kansas Horse & Buggy Doctor Receives Letter from Albert Einstein

by Jane F. Knapp, MD & Robert D. Schremmer, MD



Arthur Hertzler at his desk.
Courtesy of the Kansas Learning Center
for Health.

Besides the unpublished letter from *Gone With the Wind* author Margaret Mitchell, the correspondence of Arthur Emanuel Hertzler, MD, also included a letter to him by Albert Einstein.
Courtesy of the Kansas Learning Center for Health.

Princeton, N. J.
June 24, 1944

Summer-address June 26th-Sept.
Knollwood, Saranac Lake, N.Y.
Cottage 6.

Dr. Arthur E. Hertzler
Halstead, Kansas

My dear Dr. Hertzler:

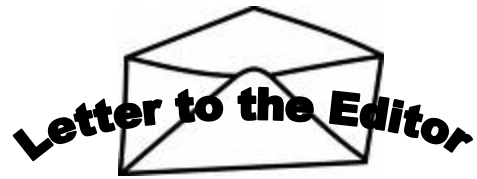
You were so kind to send me your highly interesting book "The Grounds of an Old Surgeon's Faith". I have given much time to it and was rewarded by the many interesting and genuine thoughts and witty remarks contained in it. It is really remarkable that you could find so much time to write it; I know how heavy the burden is which lies on the shoulders of a country doctor.

Certain things astonished me very much, f.i. that you have such a strong resentment against our old and great leader Moses. He was certainly--for his time--an excellent law-giver and it seems to me very doubtful if all this superstitious stuff attributed to him comes under his account at all (some times it seems to me that you were influenced by something like bad conscience having become a renegade to the Jewish community). In my opinion the essential thing in the Jewish community is not this mixture of rituals and superstition but a certain common way of life or mentality produced by a long historic process and common destiny. It is very astonishing to me that you are treating this whole question of formal religion with so much earnestness. You would hardly find an European scientist who would do so in our days. My (tentative) explanation for this behaviour is that church organization plays such an important role in American life, especially in the rural district.

Thanking you very much for the interesting hours which you have given me and which you will give me still in the future, I am

yours very sincerely,

(signed) Albert Einstein.



Erratum: Should Vitamin D Screening be a Part of Primary Care?

An error appeared in the August 2011 article, Should Vitamin D Screening be a Part of Primary Care?¹ On page 80, the formula for calculating a loading dose of vitamin D was listed as:

Loading Dose = 100 x (Desired Actual ng/mL of 25-hydroxyvitamin D) x Weight (kg)

The correct formula is as follows:

Loading Dose = 100 x (Desired – Actual ng/mL of 25-hydroxyvitamin D) x Weight (kg)

We regret the error.

Sincerely,

Justin Moore, M.D.

Nalini Reddy Kakulavaram, M.D.

Reference

¹ Kakulavaram NR, Moore J. Should vitamin D screening be a part of primary care? KS J Med 2001; 4(3):78-83.