Abstract

Purpose: I set up this survey to gather information about what I had been hearing anecdotally for several years from individuals and parents of daughters experiencing menstrual cycle difficulties after sustaining a concussion. There has been no information available or apparent interest, so I decided to create a survey myself. The purpose is to gather information that shows the issues and illustrates a need for research so that a formal study can be undertaken.

Methods: A 16-question survey regarding menstrual cycles following concussion was posted on HerConcussion.com and shared via social media and an email newsletter. The survey was anonymous.

Participants: There were 29 respondents. All were female, or responded on behalf of females under the age of 18. Respondent five-year age groups ranged from the youngest (15-19 years old) through the oldest (55-59 years old). The majority of respondents were in the 30-34 age group (n=5, 17.2%). Parents completed the survey on behalf of their daughters who were under the age of 18.

Results: Respondents experienced varied issues, different mechanisms of injury, and varied levels of activity. Number of concussions per individual were similar.

- The top mechanism of injury was Motor vehicle accident (MVA) (n=10, 34.4%). This was followed by Struck by/against something (n=8, 27.5%), Fall (n=5, 17.2%), Sports injury (n=4, 13.7%), Assault (n=1, 3.4%), and Other (n=1, 3.4%).

- Most respondents had experienced one concussion (n=14, 48.2%). Other respondents sustained two concussions (n=3, 10.3%), three (n=7, 24.1%), four (n=1, 3.4%), and 5-9 (n=4, 13.7%).

- The most common age at menarche was 12 (n=10, 34.4%).

- Regarding the question identifying how a period changed following concussion, respondents were able to make multiple selections from a list of varied issues. The top issues experienced were More headaches with their period than before the concussion (n=15, 51.7%), More painful (n=9, 31%), Heavier flow (n=9, 31%), and Missed periods some months (n=5, 17.2%). There were also instances where Periods stopped completely, Didn’t last as many days, Lasted more days, Flow was lighter, or Had multiple periods in one month (for each of those, n=4, 13.7%). Two respondents indicated that they did not experience menstrual cycle changes after concussion.

- Respondents had the opportunity to share comments as well (all anonymous). The comments provided important, telling detail about the changes and issues. Some experienced periods that lasted for weeks. Very heavy flows were also described. Vertigo was mentioned in multiple comments and seemed to have some correlation to periods. Some respondents experienced worsened PMS symptoms than before their concussion. For some, symptoms related to concussion intensified during their period. Cycles were disrupted in multiple ways. They were regular before concussion and irregular afterward. Others described skipped periods and lighter flows.

Conclusion: Females of all age groups experience difficulties with menstrual cycles following a concussion. This includes post-menopausal women who may experience some extent of bleeding after a concussion. There needs to be more focus and research regarding endocrine and menstrual cycle issues that females experience after sustaining a concussion. Such research should focus on each different life phase, from puberty through post-menopause.

In addition to research, there are immediate steps that can be taken to address this. For example, asking additional questions during patient intake at doctor appointments, screening for neuroendocrine (NED) issues, having females track menstrual cycles using the Menstrual Cycle After Concussion (MCAC) form.
Menstrual Cycle Dysfunction Following Concussion: HerConcussion.com Survey Results

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[1], conferring with Female Athlete Triad experts, and adding endocrinologists and gynecologists to concussion treatment teams.

Methods

I created a 16-question survey using the Survey product on my Constant Contact account. The survey was self-funded. The survey was set so that only one response could be input from the same computer. All responses were anonymous. It was clearly stated in the survey description and some questions that comments would possibly be published publicly, and that commenting indicated approval for sharing the information. I also asked that those that sustained a concussion but did not experience menstrual cycle changes also complete the survey for comparison purposes.

Links to the survey were posted as follows:
• Included in a website post published on HerConcussion.com (main access point)
• Shared periodically on HerConcussion and AllConcussion Twitter accounts, to multiple hashtags related to concussion, TBI, women’s sports, and sports parents
• Shared periodically on HerConcussion and AllConcussion Facebook pages
• Sent in the AllConcussion email newsletter

All social media and newsletter items linked to the website post, which provided detailed information about the survey and a link to it on a webpage set up by Constant Contact. The survey was open to those aged 18 and over, or to parents completing the survey on behalf of their daughter under the age of 18. This age information was self-reported.

The number of respondents totaled 29.

I opened the survey on December 14, 2015 and closed it on January 29, 2016.

Results

Here are the results from the survey questions. It includes the following information.

• Age Groups
• Number of Concussions
• Mechanism of Injury
• Menarche
• Cycle Changes After Concussion
• Symptoms
• Vertigo and Dizziness
• Activity Levels
• Participant Comments

Age Groups

The age group with the highest number of respondents was 30-34 (n=5, 17.2%). Three age groups had four respondents (n=4, 13.7% for each): 15-19, 40-44, and 45-49. Four age groups had two respondents (n=2, 6.8% for each): 20-24, 35-39, 50-54, and 55-59. One age group had three respondents (n=3, 10.3%): 25-29. One respondent did not indicate an age (n=1, 3.4%). (All survey questions except the first were optional.)
The selected age group identified the respondent’s or daughter’s age at the time the survey was completed. The age when a concussion was sustained may be different. Parents completed the survey for those under age 18.

While there was an option for ages 60+ on the survey, no respondents selected that age group. I think it’s important in any future studies to include a 60+ age group, as that age group commonly sustains concussions due to falls [2]. The fact that this survey focused on menstrual cycle issues following concussion is a possible reason why there were no respondents aged 60 or over. However, there was a comment from a respondent stating that bleeding issues surfaced after the concussion, which was a number of years following menopause. I’ve heard anecdotally that some have experienced menopause prematurely as a result of concussion, and some respondents indicated that as well. Therefore, I would make no assumptions regarding age groups or menopause in any survey or study regarding concussion and menstrual cycles, and would include all ages.

**Number of Concussions**

While some questions had similar results with regard to responses, one question that had a notable response was the number of concussions sustained by the respondent. Of the 29 respondents, most had one concussion (n=14, 48.2%). Others had two (n=3, 10.3%), three (n=7, 24.1%), four (n=1, 3.4%), and 5-9 (n=4, 13.7%). While there was an option of “Ten or more” for this question, no respondents indicated that they had ten or more concussions.

In future studies, I would include the “Ten or more” option because some athletes have sustained higher numbers of concussions. [3] Most respondents to this survey sustained a concussion as a result of a motor vehicle accident. Most respondents overall sustained just one concussion. A future study with a higher number of participants who had sports-related concussions might include respondents that sustained ten or more concussions.

Based on some comments, some respondents with multiple concussions indicated that they had different mechanisms of injury from the first and subsequent concussions. There were also some that had a number of years between concussions. In future studies, I think it would be helpful to include more detailed questions with regard to number of concussions, elapsed time between concussions, and mechanism of injury for each.
Mechanism of Injury

Motor vehicle accidents topped the list for mechanism of injury for the survey respondents (n=10; 34.4%). This was followed by Struck by or against something (n=8, 27.5%), Fall (n=5, 17.2%), Sports injury (n=4, 13.7%), Assault (n=1, 3.4%) and Other (n=1, 3.4%). Percentage rates for this survey are comparable with those of other studies. In the Bazarian et al., study regarding gender differences after TBI, MVA was the highest mechanism of injury for both genders, but with a higher percentage for females than males. [4] Also, CDC statistics show that the rate of TBI due to a MVA for age groups 15-24 and 25-44 was just over 20%, more so than the latter age group. Mechanism of injury is not categorized by gender. [2] However, males visited the ED for TBI more so than females during the same time periods. [5]
Menarche

There were two questions on the survey which were related to menarche (the onset of menstruation). One was the age at menarche. The other asked if the respondent was actively involved in sports at the time of menarche. There are several reasons why this information is important.

- The Female Athlete Triad can result in delayed menarche. Because much concussion research and attention focuses on sports, I thought it would be helpful to have menarche information. Also, in the 2014 Consensus Statement, the Female Athlete Triad Expert Panel listed menstrual cycle tracking from menarche onward as a screening factor for female athletes. [6]
- I thought it would be helpful to see if there were differences in those in the older age groups that did not participate in team sports when they were a teenager because there weren’t many organized sports available for them at that time in their lives. Title IX was passed into law in 1972. I wanted to see if the age at menarche was generally earlier than those in younger age groups. A related reason for that is a higher incidence of precocious puberty in recent years, where the age of menarche occurs for females of a younger age. [7]
- The Treloar et al., menstrual cycle study from 1967 [8] included menarche dates. For comparison purposes, I think it would be helpful to collect menarche information in any study related to menstrual cycles to see if there are differences between current and past results.

In this survey, the most common age for menarche was age 12 (7th grade) where (n=10, 34.4%). Age 15 – 10th grade was next highest (n=6, 20.6%). Two age listings had four respondents (n=4, 13.7% each): age 11 (6th grade) and age 13 (6th grade). Two age listings had two respondents (n=2, 6.8% each): age 10 (5th grade) and the Other category. One comment left for the Other item reported menarche at an earlier age.

There were no identifiable patterns regarding age at menarche for any particular age. Results for each age listing spanned multiple age groups. This may differ in a larger study. Given the importance and inclusion of menarche in other research, I think it would be helpful to include this question in any studies focused on menstrual cycle issues related to concussion, especially regarding females who actively participate in sports.

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**Figure 4**

Age at Menarche
HerConcussion.com Menstrual Cycle Survey

- 10 (5th grade)
- 11 (6th grade)
- 12 (7th grade)
- 13 (8th grade)
- 14 (9th grade)
- 15 (10th grade)
- Other

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With the Female Athlete Triad in mind, I included this related question on the survey: Were you actively involved in sports when you had your first period? Respondents answered as follows: yes (n=18, 62%) and no (n=11, 37.9%).

**Cycle Changes After Concussion**

Respondents reported menstrual cycle dysfunction of all types following concussion. The type of issue varied. Each respondent was able to select multiple items. Pain-related symptoms had the highest number of responses.

What is generally considered to be a “normal” menstrual cycle is one that lasts 28 days. The first day of one’s menstrual cycle is the first day of one’s period.

**Pain**

Two questions addressed pain and had the highest number of responses. The top reported issue of survey respondents was “I had more headaches with my period than before” (n=15, 51.7%). This was followed by “It was more painful” (n=9, 31%).

**Increased Flow and Duration**

Increases included heavier flows, longer duration, and multiple periods within one month. The highest response was “The flow was heavier and I had to change tampons or pads more frequently” (n=9, 31%). Two items addressed changes in duration. One was the number of days: “It lasted for more days than it did before my concussion” (n=4, 13.7%). The other addressed frequency within one month, “I had multiple periods in one month” (n=4, 13.7%).

**Reduced Flow and Duration**

Reductions included lighter flows, shorter duration, and cessation of periods. Four respondents each reported that “The flow was lighter and I didn’t have to change tampons or pads more frequently,” “It stopped completely,” and “It didn’t last as many days as it did before my concussion,” (n=4, 13.7% for each). A slightly higher number of respondents reported that “Some months, I didn’t have a period (but I used to)” (n=5, 17.2%).

**No Changes**

Two respondents reported no change with their menstrual cycles following concussion (n=2, 6.8%).
Symptoms

In the survey, I also included a question about additional symptoms that respondents were experiencing. It was possible to select multiple items. These are also found on the Rivermead Post-Concussion Symptoms Questionnaire (though sometimes worded differently). The Rivermead questionnaire is often used in treatment of and research for concussion.

Instances of each symptom are as follows. Fatigue was the highest reported symptom (n=27, 96.4%). Cognitive issues included Difficulty to concentrate (n=26, 92.8%), Feeling foggy or moving more slowly than previously (n=25, 89.2%) and Memory issues (n=23, 82.1%). Respondents reported Balance issues (n=20, 71.4%) and Dizziness (n=19, 67.8%). As noted in other parts of this survey discussion, vertigo was reported in comments by multiple respondents. There was also Headache (n=23, 82.1%), Sensitivity to noise (n=24, 85.7%), and Sensitivity to light (n=23, 82.1%). Additional physical issues included Nausea or vomiting (n=15, 53.5%) Vision changes or issues (n=22, 78.5%). Some also noted Menstrual cycle changes in this question (n=22, 78.5%). Respondents also reported Sadness or depression (n=18, 64.2%). Some respondents also selected Other (n=10, 35.7%) and identified additional symptoms.
Vertigo and Dizziness

Upon further review of individual responses there was one notable item that caught my attention. Three respondents that selected “I had more headaches” as an issue also specifically mentioned vertigo in comments. A fourth person that selected headache as an issue also selected dizziness, but did not leave a comment.

In the survey questions, I did not specifically list vertigo, but included dizziness which I assumed to include vertigo. Given the comments on this survey, I would list vertigo specifically in any future survey or study in addition to listing balance and dizziness.

Of the four respondents reporting more headaches that left comments specifically mentioning vertigo or dizziness, two also selected “The flow was heavier” and two selected “It was more painful.” No respondents in this group stated that the flow was lighter or that their period stopped. Other symptoms and characteristics varied.

In reviewing responses to a question regarding symptoms, 19 respondents selected dizziness as a symptom of their concussion.

Those that left comments specifically mentioning vertigo (n=3) mostly indicated they had heavier flows with their cycle (n=2). For the larger group that selected dizziness, the overall effect on cycles was more varied in nature. I think that it would be beneficial to study vertigo and menstrual cycle issues after concussion in more detail in the future.
Activity Levels

There were four questions regarding physical activity levels. One question overlapped with others and was subsequently excluded from this report. One question was about activities at the time the concussion was sustained and two addressed activities following concussion. Most respondents do not currently participate in sports as a member of a team (n=24, 82.7%) while some do participate (n=5, 17.2%).

However, respondents overall appeared to have an active lifestyle, or did so before sustaining their concussion. For the question “Do you exercise and stay active on a regular basis?” most respondents answered that “No – I used to but had to stop because of a concussion (n=10, 34.4%).” Other respondents answered as follows: Yes – on a team (n=4, 13.7%), Yes – regular recreational exercise such as running and cycling (n=7, 24.1%), No (n=3, 10.3%), and Other (n=5, 17.2%).
Respondents participated in a variety of activities before or after their concussion. There was a mix of team sports and recreational activities. Respondents were able to select multiple items. Running (recreational) had the highest number of respondents (n=8, 42.1%). Next highest were Cycling and Recreational lap or masters swimming (n=4, 21% for each). Soccer team and Running (marathon) each had two respondents (n=2, 10.5% for each). Five activities had one respondent (n=1, 5.2% for each): Hockey team, Cheerleading, Basketball team, Cross-country or track team, and Triathlon. Lacrosse team and swim team were listed, but no respondents selected them.

In the Other category (n=10, 52.6%), respondents left comments indicating a variety of activities. For future studies, I would include more options for a question regarding types of activities. Some of the activities that respondents listed in the Other category as comments included softball, walking, hiking, marching band, dancing, skiing, field hockey, and outdoor bootcamp. Some respondents listed multiple activities in their comments.

![Sports and Activities](HerConcussion.com Menstrual Cycle Survey)

**Question:** In which sports or activities do you participate, or did so before your concussion? Check all that apply.

- Soccer team
- Hockey team
- Basketball team
- Cheerleading
- Cross-country or track team
- Triathlon
- Swimming (recreational lap...)
- Cycling
- Running (marathon)
- Running (recreational)
- Other

![Figure 8](Activity Levels in Other Studies)

Because of the active nature of the survey respondents, I reviewed some additional research regarding physical activity and menstrual cycle issues. In a separate study, De Souza et al., found that recreationally active females (runners in particular) had more anovulatory cycles or that ovulation was impacted. Some also had luteal phase deficiency (LPD) and shorter luteal phases. The study covered three menstrual cycles. [9]

Another study also found that participants were more physically active: the University at Buffalo BioCycle Study. That study covered two menstrual cycles. Some participants were ovulatory for...
both cycles. Others had one ovulatory and one non-ovulatory cycle. For participants that had two anovulatory cycles, progesterone levels in the study were less than or equal to 5 ng/mL, although a chart shows levels less than 2 ng/mL. Study participants with one ovulatory and one anovulatory cycle had progesterone levels between 4 and 6 ng/mL, which was less than those with two ovulatory cycles. There were differences in levels for other hormones as well depending on ovulation. [10]

The BioCycle study progesterone levels brought to mind the Wunderle, Bazarian et al., study regarding menstrual cycles and concussion. [11] Researchers used progesterone levels to determine the menstrual phase at time of injury for each participant. Participants with progesterone levels that were more than 2 ng/mL were identified as being in the luteal phase (LP). Those with levels less than or equal to 2 ng/mL were identified as being in the follicular phase (FP). Researchers found that those who sustained a concussion during the LP had a worsened outcome for their concussion, in part due to a drop in progesterone: the withdrawal hypothesis. Researchers also noted that there were more participants in the FP than the LP, which they hadn’t expected.

All these studies lead me to this thought: are ovulation issues a factor in concussion recovery? Multiple studies show changes to ovulation in recreationally active women. The progesterone levels for females with anovulatory cycles may sometimes be less than 2 ng/mL. That makes me wonder if the University of Rochester study had more participants in the FP because some of the women were having anovulatory cycles, LPD, or shortened luteal phases. Female athletes of all ages can also experience amenorrhea and anovulatory cycles due to the Female Athlete Triad. For all these reasons, I think that ovulation issues warrant further research with regard to concussion. Are females without ovulation issues sometimes more likely to have longer recovery times due to a sudden withdrawal of progesterone? They might have higher progesterone levels than those with anovulatory cycles. Ovulation results in production of progesterone.

For girls in puberty, initial menstrual cycles are variable in multiple ways. Depending on the age at menarche, it can take up to two years for a girl to become fully ovulatory. [12] Concussion research for younger girls is severely lacking. Also, if you have a period, it doesn’t necessarily mean that ovulation occurred. A person could have ovulation issues and be unaware of it.

**Participant Comments**

For a number of years, I have heard stories anecdotally from individuals and parents regarding issues with menstrual cycles. It’s the reason why I thought it necessary to have this survey. The comments shared anonymously by respondents I think illustrate the varied difficulties experienced with menstrual cycles following concussion, and for which I have received inquiries and comments. From periods lasting weeks at a time to disappearing completely, there was a range of issues reported. I’ve included some of the comments shared from one question (as noted in the survey), and grouped them into several categories.

**Headaches**

“I never had headaches during my period before my concussion. After my concussion I have had headaches every day. They improve and then the week before my period start to get really bad again & especially the first couple of days of my period.”

**Heavier Flow**

“My daughter’s menstrual cycle has been out of whack since the concussion. extremely heavy flow lasting for weeks at a time.”

“The cycle has always been heavy, but now I can’t even sleep more than 2-3 hours on the first two nights because the flow will leak if I don’t change both the pad and the tampon.”
Disrupted Cycles

“Didn’t begin to start having problems until around month 3 of my last concussion.”

“My cycle consistently skipped two to three months at a time but not longer. In the ten month period since the concussion I have had only one cycle and it was extraordinarily painful and long.”

Vertigo and Dizziness

“I felt my vertigo is more intense than other days and experience more fatigue than other days too. I try to rest as much as possible days before and during my periods to help me with my symptoms.”

“More fatigue and dizziness associated with start of period”

“The physical effects of my period were not too affected. I got migraines with ovulation and as part of PMS. I actually suffered with extensive PMDD from two days post ovulation until my period would start. I link it to my concussion because as the other problems I had with it (vertigo, fatigue) lessened, the cycle associated ones went away as well.”

PMS and PCS Symptoms

“I get extremely painful cramps, pain in the right lower abdomen/lower back, dizziness/vertigo, nausea, and migraine-like headaches during my period.”

“I still experience more PCS symptoms a day or two before and the first couple of days of my period. These include headaches, dizziness, brain fog, tinnitus, fatigue. I had very few PMS symptoms prior to my concussion.”

Discussion

Because of the nature of some of the responses, my own research into this, and recent developments regarding hormones and concussion, I’ve included additional information that is relevant to this topic and survey results. There is also information that I feel to be important for future studies. These are the topics.

- Oral Contraceptives
- Progesterone
- Amenorrhea
- Ovulation Issues for Active Women
Oral Contraceptives

This survey did not include any questions regarding use of oral contraceptives and I wasn’t planning to discuss it. However, several items regarding that topic surfaced in the process of reviewing survey results and writing this report. Taken together with what I’ve heard and learned of before this point, I think it’s important to include these items.

I’ve heard anecdotally in the past several years that females (including teenagers) have been prescribed oral contraceptives to manage their menstrual cycle issues following concussion. This was particularly mentioned in instances where flows became heavier and period duration increased. Also, use of oral contraceptives was mentioned in comments.

Because vertigo was mentioned by multiple respondents in this survey, I searched in PubMed for ‘vertigo menstrual cycle’ (without quotes). Surprisingly to me, results included a study about the effect of oral contraceptives containing estrogen and progesterone on vestibular functioning. The study found that use of this type of oral contraceptive for six months increased the incidence of tinnitus and dizziness. [13] Combined oral contraceptives (COC) can also negatively affect bone mineral density (BMD). This is important for the Female Athlete Triad [6] and bone mass development for young women. [14] Bone mass development peaks in adolescent females, and it’s critical to address that to ensure bone health later in life.

The Wunderle, Bazarian et al., study found that females experienced better outcomes when taking synthetic progestin. [11]

There are additional considerations with regard to use of oral contraceptives. One is that the use of oral contraceptives has been increasing for some time [15]. Also, a study found that college-aged women purposefully alter the prescribed use of oral contraceptives to manipulate their periods. [16]

Future studies of use of oral contraceptives for treatment of menstrual dysfunction for women and teenagers that have sustained a concussion are warranted.

Progesterone

Progesterone figures prominently in discussions about concussions in general and in relation to menstrual cycles. The withdrawal hypothesis indicates that for those who sustain a concussion during the luteal phase of their cycles, it could result in a worsened recovery outcome. [11] The Female Athlete Triad treatment algorithm includes an initial endocrine review that may include a progesterone challenge test to check for secondary amenorrhea. Progesterone challenges are used to determine how to resume menstrual cycles to identify anovulatory cycles. If a person sustains a concussion during her LP phase, her progesterone level drops, and her periods stop afterward, then perhaps it would be helpful to use a progesterone challenge to test for secondary amenorrhea. This is noted in the endocrine testing algorithm in the Triad Consensus Statement [6]. The De Souza et al., study found low progesterone levels in 14% of active women that had LPD issues. [9]

Amenorrhea

Some survey respondents indicated cessation of their periods. In the question asking about menstrual cycle changes after concussion, four respondents noted that their periods “stopped completely” (n=4, 13.7%). Of those four respondents, two were in the age group 30-34, and the remaining two were in the age group 50-54. Perimenopause generally begins in the 40s and the average length of time between cycles can be three months.

One result of concussion and TBI is secondary amenorrhea. After ruling out pregnancy, there are several instances in which there might be a lack of periods.

It is known that sports participation can result in missed periods. If this occurs for an adolescent and extends longer than 90 days, it should be reviewed by a physician. [12]
A study of 104 women who sustained a TBI was conducted to review menstrual cycle and other health issues. Researchers found that 46% of the study participants had amenorrhea over a five-year span. Cycles were also affected for 68% of the participants. Also, fewer participants experienced one or more live births. [17]

A study of 30 women regarding menstrual cycles after TBI identified one item that researchers deemed significant. Before sustaining a TBI, 23% of study participants experienced missed periods. After a TBI, the number was 90%. The participants were identified as having sustained a TBI classified as mild (20%), moderate (13.3%), severe (60%), or other (6.7%). [18]

De Souza et al., believe it’s preferable to treat amenorrhea due to the Female Athlete Triad with “non-pharmacological” means. Diet and nutrition are such options. [6] [19] The Female Athlete Triad can affect teens and perhaps adults as well.

If female athletes have amenorrhea due to disordered eating, some researchers consider it to be critical to get menstrual cycles back to normal so that bone development isn’t negatively affected. [19]

One study also found that adolescents with anorexia and resultant amenorrhea experienced difficulties with cognitive functioning. This improved once weight was regained and menstrual cycles resumed. The researchers considered a normal menstrual cycle to be very important in terms of cognition. [20]

### Ovulation Issues for Active Women

Many participants in this survey led an active lifestyle prior to their concussion. At the time they completed the survey, respondents were yet unable to participate in their pre-concussion physical activities. As indicated in Figure 8, most respondents participated in recreational running. It was the top activity (n=8, 42.1%).

De Souza et al. conducted a study that looked at menstrual cycles for women that exercised recreationally and those that were sedentary. [10] Study participants included recreational runners. Researchers found that the active women had more instances of LPD (42%) and anovulatory cycles (16%) than did the sedentary women. For sedentary women, most were ovulatory (91%) vs. those that experienced LPD (9%). The study looked at three cycles. For some of the exercising women, cycles fluctuated during the three months. There was a mix of ovulatory and anovulatory cycles. Because of the study results, the researchers felt that reviewing only a single menstrual cycle in other studies would miss instances of LPD and anovulation by 38%.

Additional studies looked at recreational runners, one of which looked at those who ran at least 12 miles per week. They, too, found impacted luteal phases and progesterone levels. [21] [22] [23]

This survey asked about menstrual cycles over an extended timeframe, not specifically for one or several months. The De Souza et al., study [9] thought that there should be at least three cycles. The UB BioCycle study looked at two cycles and found issues. [10] I think that any future study looking at menstrual cycle issues following concussion should cover at least three consecutive cycles and check for anovulatory and LPD issues.

### Conclusions

Females of all ages and life phases experience menstrual cycle difficulties following concussion, and research is needed to determine causes and determine treatments. Survey results reflect what I’ve heard from people the past several years. There is a wide variety of issues, including shorter, lighter periods; periods stopped completely; and heavier and longer periods. Issues existed in all life phases and ages from 15-19 through 55-59. Some concussion symptoms worsen during periods, with headache being the most prominent. Vertigo, headache, and cycle changes seem to be related in this survey, and would benefit from further study. Additional factors such as use of oral contraceptives and the Female Athlete Triad...
should also be researched, as there may be an impact on those that have experienced sports-related concussions (SRC) and bone health could be affected. Attention should also focus on concussion due to motor vehicle accidents (MVA) as well as other sources and mechanisms of injury. Most respondents sustained their concussion from a MVA and experienced changes after just one concussion. Research should address all ages and life phases, from puberty through post-menopause. In the meantime, immediate steps can be taken to begin addressing some issues. These are noted in the Recommendations. Concussion treatment teams should also expand to include endocrinologists and gynecologists.

**Recommendations**

There is a critical need for attention and study for menstrual issues following concussion. I've included some actions that could be taken immediately, some without much extra effort or cost. Education should be addressed. For future research, I've included topics to consider in developing a study.

**Immediate Steps**

- At physician appointments, ask “have there been changes to your period after your concussion” in addition to “when was your last period” during patient intake. Ask about their period duration: has that lengthened or shortened? Don’t just ask for the start date of your last period. For those who are postmenopause, ask if they’ve experienced issues with spotting or bleeding.

- Take menstrual cycle issues seriously. I’ve heard anecdotally that doctors do not consider concerns regarding menstrual cycles after concussion to be important. Also, a 2002 study found that over half of women with menstrual cycle issues in the study had to ask the same physician three separate times for testing, or had to visit three different physicians before their amenorrhea ovarian issues were diagnosed. [24]

- Have patients record their menstrual cycles over the course of their recovery. See Menstrual Cycles After Concussion (MCAC) form. [1]

- Screen for neuroendocrine disorder (NED) if concussion symptoms persist after three months. The Female Athlete Triad screens for endocrine issues at the start. [6]

- Expand concussion treatment teams to include endocrinologists and gynecologists.

- Screen for the Female Athlete Triad as well. If found to be an issue, review the RTP guideline for the triad and combine with RTP guidelines for concussion.

- Consult with Female Athlete Triad experts, as they have many years of data regarding menstrual cycles and physical activity.

- In preseason baseline tests or physician physical examination approval for sports participation, include information about an athlete’s menstrual cycle. Determine what phase her cycle is in at the time of testing, if it’s regular, and if there are any issues. Use the Female Concussion Baseline Record (FCBR). [25] After a concussion, compare the state of an athlete’s cycle with the baseline. If there is a change, incorporate the Female Athlete Triad RTP algorithm if there are issues with menstrual cycles. Continue to monitor and address cycle issues in the ensuing months.

- Consider reviewing progesterone levels to determine if a person is experiencing anovulatory cycles, not just go by the date of last menstrual cycle. You can have what seems to be a period but may actually be experiencing anovulatory cycles. Ovulation results in the production of progesterone.
Education

- Develop educational materials for patients and parents regarding possible effects of menstrual cycles after a concussion. I’ve heard from individuals and parents that they often wonder if they or their daughters are the only ones with such issues.
- Share information with physicians treating females, as I’ve also heard that some doctors are dismissive of inquiries and insist that there is no connection between concussion and menstrual cycle issues that begin after the concussion. I’ve also heard that physicians are prescribing birth control pills to address menstrual issues after a concussion, not testing for endocrine issues, and that they don’t know what to do.

Studies

- Initiate a formal study to determine the types of menstrual cycle issues that females of all ages and life phases are experiencing following concussion. Ensure that it includes all mechanisms of injury such as motor vehicle accidents, falls, assault, and blast injuries in addition to sports.
- In future surveys and studies, specify vertigo as a symptom or item. Do not just use dizziness and balance.
- Ask for the current age and age at which the last concussion was sustained. A person might have had multiple concussions over an extended time period (years or decades, for instance).
- Ask for the mechanism of injury for each. Some respondents had multiple concussions, but from different sources.
- Cover a time span of at least three consecutive months. The De Souza et al., study found issues by looking at three months. The University at Buffalo BioCycle study included two months and found anovulatory and ovulatory issues. Researchers stated that it’s “one of a few” studies looking at more than one cycle. [10] Also, three months (90 days) is often a timeframe mentioned in guidelines and references. During perimenopause, one can also experience three months without a period.
- Study sedentary vs. physically active females as well as ovulatory status. Would that make a difference regarding concussions from motor vehicle accidents vs. sports-related concussion? Also, review team sports vs. recreational vs. sedentary females. Focus as well on all life phase age groups.

Drawbacks

This survey has several drawbacks. This is a survey, not a formal study. The goal of the survey is to surface information about menstrual cycle dysfunction, show a need for formal research studies, and encourage researchers to initiate a formal study.

The survey was completed and the results analyzed and prepared by a Technical Communicator (aka Technical Writer), not a medical researcher. Some may find that to be an issue. However, there are strengths related to that, as noted in the following section.

In the survey questions, I did not specifically list vertigo, but included dizziness which I assumed to include vertigo. Given the comments on this survey, I would list vertigo specifically in any future survey or study in addition to listing balance and dizziness.

Because the survey was anonymous, I was unable to verify ages of the respondents. However, upon reviewing comments with the responses, I feel that respondents entered their ages accurately and that parents responded for those under the age of 18.
Strengths

Because of my advocacy work and online presence, parents and individuals have been reaching out to me for assistance for several years. I often hear about gaps in both knowledge by the medical community and in treatment options. I’m able to identify and surface the concerns of many regarding individual topics. Menstrual cycle dysfunction is one such issue. I set up the survey because I was continually hearing about serious problems with menstrual cycles, but could find little information about it. It’s an important issue that would benefit from immediate attention and research.

Because of my professional background in Technical Communications, I am able to thoroughly research this topic in addition to developing and administering the survey. I was able to review technical studies and materials, analyze and then prepare information for a general audience, and identify issues that need to be addressed and considered.

There was only one survey question that was required. It was the first one that stated that the respondent was 18 years of age or over, or that it was a parent responding on behalf of their daughter. Respondents answered the remaining optional questions and provided details in multiple comments for varied questions. Given the reluctance in society to discuss menstrual cycles in general, and certainly publicly (albeit anonymously in this instance) the willingness of respondents to complete all or most questions and provide helpful comments is to be commended. I personally am grateful to respondents for sharing their experiences which I believe will be helpful to many.

Conflicts of Interest

There are no conflicts of interest. The survey is self-funded.

Contact

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