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The combined oral contraceptive pill and the assumed 28-day cycle

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Summary
Some studies involving women taking the combined oral contraceptive pill (COCP) have on occasion assumed the COCP group to have a rigid 28-day pharmaceutically driven cycle. Anecdotal evidence suggests otherwise, with many women adjusting their COCP usage to alter the time between break-through bleeds for sporting and social reasons. A prospective field study involving 533 scuba diving females allowed all menstrual cycle lengths (COCP and non-COCP) to be observed for up to three consecutive years (St Leger Dowse et al. 2006). A total of 29% of women were COCP users who reported 3,241 cycles. Of these cycles, only 42% had a rigid 28-day cycle, with the remainder varying in length from 21 to 60 days. When performing studies involving the menstrual cycle, it should not be assumed that COCP users have a rigid confirmed 28-day cycle and careful consideration should be given to data collection and analysis. The effects of differing data interpretations are shown.

Keywords
Extension; menstrual cycle; oral contraceptive pill; social advantage

Introduction

When comparing women on the combined oral contraceptive pill (COCP) with women not on the COCP (non-COCP) some investigators have assumed the COCP group to have a rigid 28-day pharmaceutically driven cycle, or relied on retrospective information from respondents regarding 'average length of cycle' (Rudge 1990; Doyle et al. 1997; Lee et al. 2003). Numerous studies observing reliability of recall of the date of the last menstrual period (LMP), or compliance and reasons for ceasing to take the COCP exist (Bean et al. 1979; Aubeny et al. 2002, 2004; Wegienka and Baird 2005). However few, if any, studies have observed prospectively the incidence of 'socially' extended cycles in a large group of women for a considerable period of time. Anecdotal evidence suggests many women continue the COCP without break, altering the time between menstrual periods for sporting, social or other reasons. We present evidence from a prospective field study of women divers that supports this anecdotal evidence. Additionally we hypothesised that retrospective studies involving the menstrual cycle and the COCP may suffer from the extension of cycles by women in a deliberate attempt to avoid a bleed, and assuming a 28-day cycle may therefore adversely affect the conclusions of a study.

Methods

To investigate the use of the COCP for social advantage, and show the potential effect of assuming a 28-day cycle,

we analysed data from a prospective study of a large group of women who maintained menstrual and scuba diving records for up to three consecutive years. The study allowed data analysis from both COCP and non-COCP users. Data included general and gynaecological health, contraception and COCP usage. Date-defined 'monthly calendar diaries' were provided on which respondents recorded COCP usage, bleeding, type of bleed (spotting, low, medium and heavy) and basic dive profiles (maximum depth, total dive time, decompression stop required, and reported problems during diving, RPDD). Spotting or menstrual cycles of less than 21 days were not regarded as a menstrual period and therefore not analysed (Treloar et al. 1967; Cooper et al. 1996; Guyton and Hall 1997). Respondents completed the menstrual detail irrespective of whether or not they were diving during that particular month/cycle, and completed diving details irrespective of whether they were menstruating. The length of every menstrual cycle was recorded, and the day in the cycle of every RPDD was also known. We analysed the data using actual recorded data regardless of length, normalised data, and data from cycles of only 28 days.

To normalise the menstrual cycles the observed number of days from the first day of the last menstrual period (LMP) to RPDD was transformed into the relative position (the normalised day) in a normalised cycle with a length of 28 days (Sibley et al. 1999; Lee et al. 2003; Ross et al. 2003). The normalised day in which each RPDD occurred was calculated using the following formula: Normalised day $= 28 \times D/L$ where D is number of days between the

RPDD and the first day of the LMP, and L is the recorded actual length of the cycle in which the RPDD occurred. The normalised day of the menstrual cycle is therefore a number between 1 and 28. A normalised day does not refer to the hormone status of the menstrual cycle.

Diaries were returned every 6 months and data entered by trained operators, with quality assessment implemented as appropriate. Participation by the women was entirely voluntary and no incentive was offered to participate. Each woman was free to terminate her participation at any time.

Results

A total of 570 women returned diaries for 6 months, with 62% (351/570) returning diaries for three consecutive years. Of the study group, 533 were menstruating, 29% (153/533) of who were COCP users. Age range at the start of the study for the COCP users was verified as 14–52 (mean 28.8, SD ± 6.35), and body mass index (BMI) ranged from 17–33 (mean 23.9, SD ± 3.1).

The COCP group (153 individuals) recorded 3,241 cycles varying in length between 21 and 60 days (Figure 1). Only 42% (1,356/3,241) of the cycles were a classic 28-day length, with the remaining 58% (1,885/3,241) falling outside the 28 days. Further interrogation of the data showed 14% (444/3,241) of the cycles were between 21 and 26 days in length, 65% (2,121/3,241) between 27 and 29 days, and 21% (676/3,241) between 30 and 60 days in length. Cycles of extended length showed peaks at 35, 42, 49 and 56 days.

Data in Figure 1 supports anecdotal observations that women deliberately extend, and in some cases reduce, the time between menstrual periods. Menstrual periods beyond 28 days are shown in the inset of Figure 1; however, these data are small and should be treated with caution.

Figure 2 shows the results of the RPDD data in three interpretations across a typical 28-day cycle and demonstrates the data presentation can shift the position of the findings across the menstrual cycle. All three methods showed an increase in the number of RPDD in the first week of the cycle, with the normalised data also showing a slight increase of RPDD in the fourth week. In the 28-day cycle only data, the increase in RPDD is only seen in the first week of the cycle, with weeks 2, 3 and 4 showing a relative downward trend.

Discussion

These data support anecdotal observations that women deliberately moderate the usage of the COCP for their
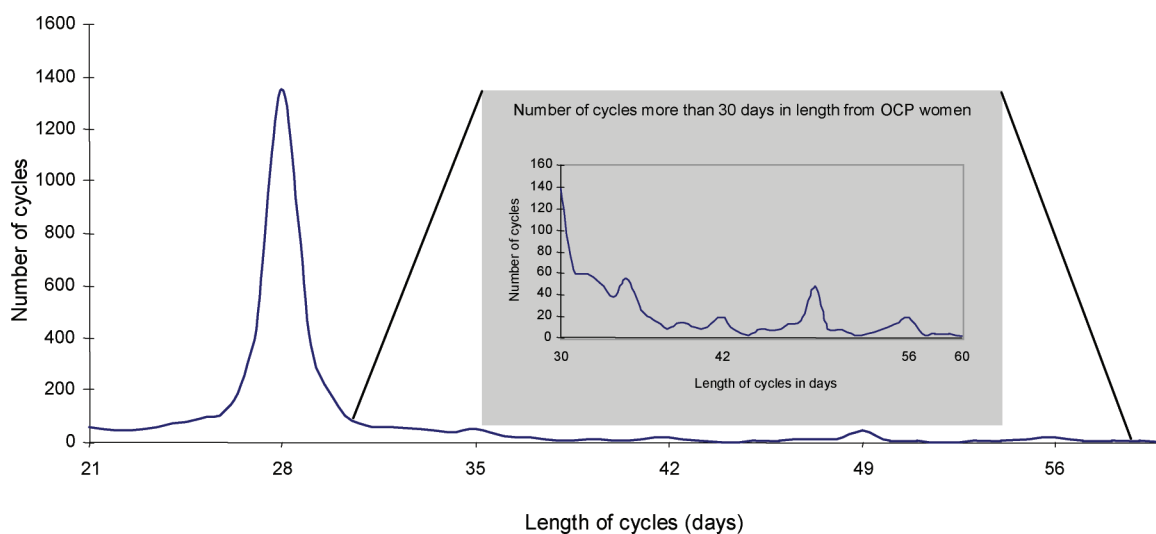

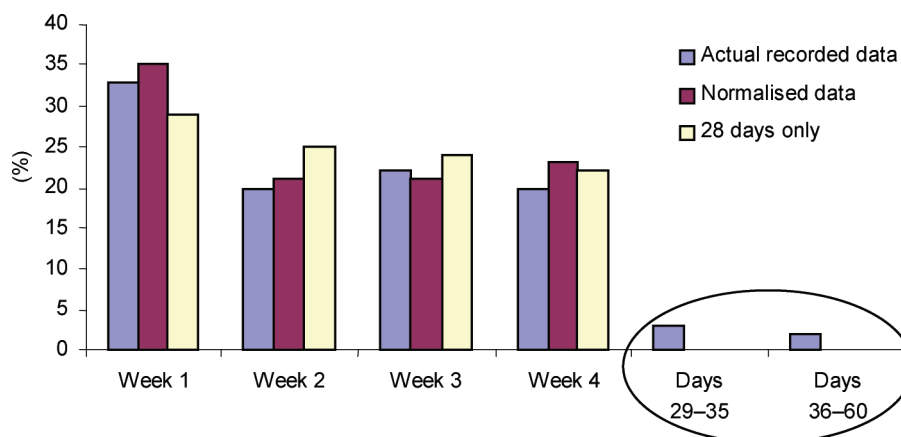Figure 1. Number of cycles from 21 to 60 days in length.

Figure 2. Percentage of reported problems during diving (RPDD) across the menstrual cycle: from three methods of data presentation.

social convenience to alter the timing of a bleed. Different presentation of the RPDD data suggests that investigators and clinicians should take care when relying on retrospective reporting, or the assumption that women on the COCP have a rigid 28-day cycle.

In this prospective study, 58% of COCP menstrual cycles fell outside of the expected classic 28-day frequency, with cycles of extended length showing a weekly trend (35-, 42-, 49-, and 56-day lengths). The relatively large group of women had been prospectively observed over a long period of time, with the primary investigation designed to examine the incidence of RPDD (St Leger Dowse et al. 2006). As a result, the exact dates and lengths of all the menstrual periods for up to three consecutive years of every woman for all the time they participated in the study, irrespective of whether they were COCP users or not, were known. Therefore, there was no reliance on recall from the participants regarding the date of their last menstrual period (LMP) (Wegienka and Baird 2005). The women were not focused into the aims of the study or aware of any additional analysis that might take place, and therefore did not make changes to their activities (St Leger Dowse et al. 2004). Unsolicited free-form text was received from many women with explanations regarding reasons for continuing to take the COCP, thus extending cycle times and avoiding a bleed. Frequently reported reasons were sporting activities, such as scuba diving, living on a boat, holidays, or the prospect of a relationship, demonstrating that the women were not using the COCP to avoid a bleed *per se*, but purely for their own convenience at times to suit their lifestyle. These data therefore provided a unique window on the real world of socially and sexually active women who dive, allowing us to consider anecdotal observations against recorded data. However, the weaknesses with this field study are all those associated with self-reporting data. Due to the physics of the sport, a non-diving control was considered inappropriate for this particular study.

Studies and overviews of the continuous usage of the COCP exist (Miller and Notter 2001; Miller and Hughes 2003). Since the 1970s, numerous studies have observed women's preference and perception for patterns of vaginal bleeding, with emphasis regarding the use of the COCP. How a woman perceives her menstrual cycle may also vary with some women seeing the absence of a bleed as detrimental and others seeing the absence of a bleed as beneficial (Loudon et al. 1977; Hamerlynck et al. 1987; Cachrimanidou et al. 1993; Johnston-Robledo et al. 2003, Andrist et al 2004; Reproductive Health Reproline 2006). Short-term studies may inflate accuracy of actual cycle length due to insufficient coverage, which in turn may not show how women use the COCP to benefit lifestyle factors over a long period of time (Wegienka and Baird 2005). While it is well understood within the gynaecological fraternity that women may continue to take the COCP without physician recommendation, in order to avoid a menstrual period, outside that discipline it is not always so well acknowledged. Anecdotal evidence also suggests that a 28-day COCP cycle is often assumed by clinicians. Some studies have assumed women on the COCP to have a classic pharmaceutically driven cycle, have truncated the data to 28 days, or have omitted to define the COCP criteria in the methodology of the investigations, thereby implying that a 28-day cycle could have been assumed (Rudge 1990; Doyle et al. 1997; Krause et al. 1998; Lee et al. 2003).

The methodology and data storage systems in the St Leger Dowse (2006) study allowed the ability to analyse data from COCP users. By observing the COCP data of more than 28 days, it allowed the normalising and inclusion of data that might otherwise have been discarded (Ross et al. 2003; Wegienka and Baird 2005). Choosing data from cycles of only 28 days not only reduces the data but flattens or changes the effect (Figure 2).

Conclusion

When considering design criteria for prospective studies involving the menstrual cycle, careful attention should be paid to recording every cycle length. The questions to be asked are: (1) Can assuming a classic 28-day cycle for COCP users ultimately influence the findings of a study? (2) Are we eliminating valuable data by analysing cycles of only 28-days? (3) What affects will these have on the outcome of a study? Results may be biased if it is assumed every COCP cycle is 28 days. Using data from menstrual cycles of only 28 days may reduce data availability. It is important to understand the data collected. COCP users should not be *assumed* to have a classic pharmaceutically driven 28-day cycle; flawed assumptions may adversely influence study results.

References

Andrist LC, Arias RD, Nucatola D, Kaunitz AM, Musselman BL, Reiter S et al. 2004. Women's and providers' attitudes toward menstrual suppression with extended use of oral contraceptives. Contraception 70:359–363.

Aubeny E, Buhler M, Colau JC, Vicaut E, Zadikian M, Childs M. 2002. Oral contraception: patterns of non-compliance. The Coraliance study. European Journal of Contraception and Reproductive Health Care 7:155–161.

Aubeny E, Buhler M, Colau JC, Vicaut E, Zadikian M, Childs M. 2004. The Coraliance study: non-compliant behaviour. Results after a 6 month follow-up of patients on oral contraceptives. European Journal of Contraception and Reproductive Health Care 9:267–277.

Bean JA, Leeper JD, Wallace RB, Sherman BM, Jagger H. 1979. Variations in the reporting of menstrual histories. American Journal of Epidemiology 109:181–185.

Cachrimanidou AC, Helberg D, Nilsson S, Waldenstrom U, Olsson SE, Sikstrom B. 1993. Long interval treatment regimen with a desogestrel containing oral contraceptive. Contraception 48:205–216.

Cooper GS, Sandler DP, Whelan EA, Smith KR. 1996. Association of physical and behavioural characteristics with menstrual cycle patterns in women age 29–31 years. Epidemiology 7:624–628.

Doyle K, Baek PS, De Long ER, Uguccioni D, Dear G, Stolp B et al. 1997. Menstruation as a risk factor for decompression illness (DCI) in female scuba divers taking oral contraceptives (OC). Undersea and Hyperbaric Medicine 24(Suppl.): 33.

Guyton AC, Hall JE. 1997. Female physiology before pregnancy; and the female hormones. In: Guyton AC, Hall JE, editors. Human physiology and mechanisms of disease. Philadelphia: Saunders. pp 658–669.

Hamerlynck JV, Vollebregt JA, Doornebos CM, Muntendam P. 1987. Postponement of withdrawal bleeding in women using low-dose combined oral contraceptives. Contraception 35:199–205.

Johnston-Robledo I, Ball M, Lauta K, Zekoll A. 2003. To bleed or not to bleed: young women's attitudes toward menstrual suppression. Women's Health 38:59–75.

Krause KM, Pilmanis AA, Webb JT. 1998. The effect of menstrual day on decompression sickness (DCS) incidence in female research subjects. Aviation, Space, and Environmental Medicine 69:199.

Lee V, St Leger Dowse M, Edge C, Gunby A, Bryson P. 2003. Decompression sickness in women: a possible relationship with the menstrual cycle. Aviation, Space, and Environmental Medicine 74:1177–1182.

Loudon NB, Foxwell M, Potts DM, Guild AL, Short RV. 1977. Acceptability of an oral contraceptive that reduces the frequency of menstruation: the tri-cycle pill regimen. British Medical Journal 2:487–490.

Miller L, Notter K. 2001. Menstrual reduction with extended use of combination oral contraceptive pills: randomized controlled trial. Obstetrics and Gynecology 98:771–778.

Miller L, Hughes J. 2003. Continuous combination oral contraceptive pills to eliminate withdrawal bleeding: a randomized trial. Obstetrics and Gynecology 101:653–661.

Reproductive Health Reproline. 2006. The Reading Room. How women perceive menstruation and their menstrual patterns. Available at: www.reproline.jhu.edu/english/6read/6issues/6progress/prog52_b.htm (Accessed 15 November 2006).

Ross C, Coleman G, Stojanovska C. 2003. Prospectively reported symptom change across the menstrual cycle in users and non-users of oral contraceptives. Journal of Psychosomatic Obstetrics and Gynaecology 24:15–29.

Rudge FW. 1990. Relationship of menstrual history to altitude chamber decompression sickness. Aviation, Space, and Environmental Medicine 61:657–659.

Sibley P, Vankrieken L, Durham AP, Ei Shami AS. 1999. Impact of the menstrual cycle on BR-MA (CA15-3) and OM-MA (CA125) values, as determined by automated chemiluminescent assays on the Immulite analyser (abstract 385). Clinical Chemistry 45:A109.

St Leger Dowse M, Gunby A, Moncad R, Fife C, Bryson P. 2004. A prospective field study of reverse dive profiles in UK female recreational divers. South Pacific Underwater Medicine Society Journal 30:183–188.

St Leger Dowse M, Gunby A, Moncad R, Fife C, Morsman J, Bryson P. 2006. Problems associated with scuba diving are not evenly distributed across a menstrual cycle. Journal of Obstetrics and Gynaecology 26:216–221.

Treloar AE, Boynton RE, Behn BG, Brown BW. 1967. Variation of the human menstrual cycle through reproductive life. International Journal of Fertility 12:77–126.

Wegienka G, Baird DD. 2003. Potential bias due to excluding oral contraceptive users when estimating menstrual cycle characteristics. American Journal of Epidemiology 158:947–950.

Wegienka G, Baird DD. 2005. A comparison of recalled date of last menstrual period with prospectively recorded dates. Journal of Women's Health 3:248–252.