Background: First episode genital herpes simplex virus (HSV) infections can be classified into three groups, primary genital herpes (no previous exposure to HSV), non-primary first episode (IgG antibody to HSV of the non-presenting type), and first episode with pre-existing IgG HSV antibodies. The use of IgM to classify first episode genital herpes has not been evaluated.

Objective: To evaluate the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of HSV-1 and HSV-2 IgM antibodies for the diagnosis of first episode genital herpes, when compared with clinical diagnosis.

Methods: Patients with a first clinical episode of genital herpes were recruited. Sera were tested for IgG antibodies to HSV-2 using an indirect enzyme linked immunosorbent assay (ELISA). Equivocal results were resolved by western blot. HSV-1 IgG and IgM and HSV-2 IgM antibodies were detected using western blot.

Results: 157 patients were recruited. 31 were excluded (missing data or no detectable antibodies and negative viral isolation). Therefore, 126 patients were included in the analysis. 23 (18.3%) had primary genital herpes, 34 (27.0%) non-primary first episode, and 69 (54.8%) had pre-existing genital herpes. The specificity and PPV of HSV IgM was 100%; the sensitivity was 79% and the NPV 85%.

Conclusion: IgM HSV serology may be useful in the management of some patients with first episode genital herpes and provide an indication of the source of infection. Drawbacks include the low sensitivity and NPV, lack of availability, IgM antibodies may occasionally be produced in response to recurrent infection and, finally, IgM antibodies may take up to 10 days to develop and last 7–10 days.

METHODS
Study setting and patient recruitment
Patients who presented to the Sydney Sexual Health Centre (SSHC) between September 1995 and November 1998 within 4 weeks of the first onset of genital symptoms suggestive of genital herpes were asked to participate in the study. The study was approved by the South Eastern Sydney Area Health Service research ethics committee and written informed consent was obtained from all participants. A self administered questionnaire was completed, to obtain details of diagnosed or suspected previous oral and/or genital herpes infections, other past sexually transmitted infections (STIs), and recent sexual practices including condom use. In addition, information regarding recent sexual partner(s) was obtained including whether the partner(s) had oral and/or genital herpes or symptoms suggestive of herpes and whether antiviral medication was being used. The SSHC clinical staff performed...
126 patients were included in the analysis. Consequently, HSV-1 IgG was detected using western blot. The available HSV-1 IgG ELISA tests all have poor levels of sensitivity and specificity. Equivocal ELISA results were resolved by western blot. The available HSV-1 IgG ELISA tests all have poor levels of sensitivity and specificity. Consequently, HSV-1 IgG was detected using western blot. These methods allowed us to accurately detect IgG antibodies to HSV-2 and HSV-2 in particular to readily identify individuals with dual infection. HSV-1 IgM and HSV-2 IgM antibodies were detected using western blot.

**Patient classification**

Using the clinical history, examination findings, viral culture and serology, we were able to classify the patients into three groups.

**Primary genital herpes**—first clinical genital HSV infection with no previous exposure to HSV—that is, no IgG to HSV-1 or HSV-2.

**Non-primary first episode genital herpes**—first clinical genital HSV infection with IgG antibody to HSV of the other type—for example, new HSV-2 genital infection with pre-existing IgG to HSV-1.

**Pre-existing genital herpes**—first genital herpes episode with pre-existing IgG HSV antibodies of the same type.

**HSV serological testing**

Sera were stored at −20°C and tested for antibodies to HSV-1 and HSV-2. HSV-2 IgG antibodies were detected using an “in house” indirect enzyme linked immunosorbent assay (ELISA) specific to glycoprotein G2 (gG2). The assay has levels of sensitivity and specificity of greater than 98%. Equivocal ELISA results were resolved by western blot. The available HSV-1 IgG ELISA tests all have poor levels of sensitivity and specificity. Consequently, HSV-1 IgG was detected using western blot. These methods allowed us to accurately detect IgG antibodies to HSV-2 and HSV-2 in particular to readily identify individuals with dual infection. HSV-1 IgM and HSV-2 IgM antibodies were detected using western blot.

**Data entry and analysis**

Questionnaire responses and the serological results were entered onto a study database. The SPSS computer program was used to derive descriptive and comparative statistics.

**RESULTS**

In all, 157 patients who presented with clinical symptoms of first episode genital herpes agreed to participate in the study. Eighty four of the 157 patients were female (53.5%), 64 (40.8%) were heterosexual males, and nine (5.7%) homosexual males. Overall, 31 patients were excluded including 11 (40.8%) were heterosexual males, and nine (5.7%) homosexual males. On examination, Ms A was noted to have several vesicles and shallow ulcer on both sides of the vulva. Viral culture from the affected area revealed HSV-2. Serology showed HSV-1 IgG and IgM negative, HSV-2 IgM positive, and HSV-2 IgM negative. Serology indicated a primary HSV-2 infection (fig 2) and was useful in providing information to the couple about the probable source of the infection.

**Some typical cases**

**Patient 1**

Mr B presented to the clinic with a 6 day history of blisters on his penis and a urethral discharge. He had had a regular female sexual partner for the past 8 months and she recognised the lesions to be similar to those experienced by an old boyfriend diagnosed with genital herpes. She had never had any symptoms. HSV-2 was isolated from Mr B’s penile blisters. Mr B’s serology showed HSV-1 IgG negative, HSV-2 IgG negative, HSV-1 IgM negative, HSV-2 IgM positive. Interpretation—non-primary first episode HSV-2 infection, (previous HSV-1 infection, fig 1). The serology was not helpful in this case.

**Patient 2**

Ms A presented to the clinic complaining of genital discomfort, dysuria, and a vaginal discharge of 3 days’ duration. She was in a new sexual relationship, and had vaginal and orogenital sex with her partner. They used condoms intermittently for vaginal sex and never for orogenital sex. Her partner had no symptoms or signs suggestive of genital herpes but did have occasional cold sores. On examination, Ms A was noted to have several vesicles and shallow ulcer on both sides of the vulva. Viral culture from the affected area revealed HSV-2. Serology showed HSV-1 IgG and IgM negative, HSV-2 IgM positive, and HSV-2 IgG negative. Serology indicated a primary HSV-2 infection (fig 2) and was useful in providing information to the couple about the probable source of the infection.

**Patient 3**

Ms S presented with genital discomfort, ulceration, and dysuria of 5 days’ duration. A small crop of vesicles was noted on the left side of the vulva as well as a superficial ulcer close to the urethra. HSV-2 was grown on culture of the lesions.
DISCUSSION

This study has shown that patients who present with a first clinical episode of genital herpes may be classified into three categories on the basis of history, clinical features, viral isolation, and serology. The categories are true primary infection (IgM positive and/or viral culture positive and IgG negative at the time of presentation), non-primary first episode (IgG positive for one of the two viruses with IgM antibody to the other) and previous infection (both HSV-1 and HSV-2 IgG positive and IgMs negative).

This classification is useful in defining the natural history of first episode genital herpes and in providing patients and their partners with helpful information about the source of the infection. Many individuals acquire genital herpes in the context of monogamous relationships and knowing whether the infection is new or pre-existing may be very reassuring or at least help to unravel what is sometimes seen as an illogical situation. In this study, in patients presenting with a first episode of genital HSV infection, the specificity and positive predictive value of HSV IgM antibodies was 100%. However, this test has low sensitivity (48%) and negative predictive value (60%).

The use of HSV IgM antibodies has a number of drawbacks. Firstly, IgM type specific HSV serology is not widely available. Secondly, IgM antibodies may take up to 10 days from exposure to develop and last 7–10 days and patients may present before or after this time interval making the test relatively impractical. Finally, IgM occasionally may be produced in response to a severe recurrence rendering interpretation more difficult. On the other hand, the test has high specificity and positive predictive value in patients with “new” genital herpes, making it useful as a confirmatory test.

Patients having the test will require careful assessment and counselling. Information on the timing of the antibody responses and the meaning of positive and negative tests will need to be provided before the test is taken. Follow up will be required to explain the result, and provide support. Patients who discover that they have pre-existing infection may be concerned about where they acquired it from, whether they have infected their current and/or previous sexual partners, and whether they can transmit it to future partners. If the current partner has not acquired the infection, careful advice about strategies to reduce transmission will need to be provided including condom use and the possible benefits of suppressive antiviral therapy.

Serology should not be relied upon to make treatment decisions and all patients presenting with a first episode of genital herpes should immediately be considered for a course of antiviral therapy. Overall, IgM type specific serology offers some benefits for individuals presenting with a first episode of genital herpes and their partners, particularly those who are anxious to know more about the possible source of the infection. However, all patients offered the test will need to be provided with detailed information about the test’s interpretation and limitations. Ongoing counselling and support for patients and partners will also be essential.

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CONTRIBUTORS

The study was conceived and designed by AM and AC; JT and CS performed the serological tests. The study was coordinated by RLT. Data collection and patient recall was the responsibility of JP and CM performed the statistical analysis. The manuscript was drafted in collaboration with all the authors.
Is HSV serology useful for the management of first episode genital herpes?

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