This paper presents the results of clinical and virological investigations on patients with genital herpes attending the venereal disease department at St. Thomas' Hospital between February and December, 1966. The results of some studies on cases of extra-genital herpes are also included for comparison.

Primary herpes simplex virus (HSV) infection is usually subclinical (Scott, 1957), but may occasionally, especially in childhood, produce severe infection with marked constitutional symptoms, e.g. disseminated visceral herpes (McKenzie, Hansen, and Becker, 1959), gingivostomatitis (Dodd, Johnston, and Buddingh, 1938), follicular conjunctivitis (Granström, 1937), meningencephalitis (Whitman, Wall, and Warren, 1946) and vulvovaginitis (Slavin and Gavett, 1946). Primary herpes genitalis appears to be a rarity. One well-documented case in a man aged 23 has been reported, this being associated with aseptic meningitis and a 22-fold rise in neutralizing antibody titre (Duxbury and Lawrence, 1959). After primary infection, subsequent attacks may present as localized lesions, common sites being the lips, cornea, buttoks, nipples, and genitalia. Such lesions may be recurrent and are often provoked by such excipients as fever, sunshine, trauma, and stress (Scott and Tokumaru, 1965). When herpes infection recurs there is a strong tendency for the same site to be involved (Burnet and Williams, 1939; Scott, 1957). The presence of neutralizing antibody does not necessarily protect against recurrent infection (Andrewes and Carmichael, 1930; Scott, 1957).

Genital lesions appear initially as grouped vesicles 2 to 3 mm. in diameter, often with some surrounding erythema. Regional nodes are not usually enlarged unless secondary bacterial infection is present. The vesicles often persist for 1 to 4 days and then either become purplar and dry, or rupture leaving superficial ulcers.

Herpes genitalis is usually considered to be venereally acquired (Unna, 1883; Fournier, 1896; Tyler, 1957). It is a condition almost exclusively of young adults (i.e. of the age of maximum sexual activity) and an initial attack, but not necessarily subsequent attacks, usually follows a few days after intercourse. In men, lesions may occur on the prepuce, glans penis, or penile shaft; in women, lesions may occur on the vulva, vagina, or cervix. The diagnosis is simple enough when typical vesicles are present but, when ulceration occurs, other conditions have to be differentiated. The most important of these is syphilitic chancere, but such diseases as chancroid, lymphogranuloma venereum, candidosis, erythema multiforme, and Behçet's syndrome may also have to be considered.

Material and Methods

A consecutive series of sixty patients, thought on clinical grounds (vrisa supra) to have genital herpes, were investigated. The patients were asked the duration of their lesions and whether they had previously experienced either a similar genital eruption or herpetic lesions elsewhere.

Syphilis was excluded by serological tests (Wassermann reaction and Reiter protein complement-fixation test). Where appropriate, dark-ground studies on material taken from genital ulcers were also performed.

Vesicular fluid or scrapings from the base of ruptured vesicles were obtained from genital lesions. The material was immediately immersed in 3 to 4 ml. of virus transport medium (Hanks's BSS; bovine plasma albumen 0·4 per cent.; and antibiotics), and within 2 hours of the specimen's arrival at the laboratory was inoculated into HeLa cell cultures (0·2 ml.) and whenever possible onto the chorioallantoic membrane (CAM) of 11-day-old fertile hens eggs (0·05 ml.). The presence of HSV in cultures exhibiting cytopathic effect (CPE) was confirmed by neutralization tests employing virus-specific rabbit antiserum and by inoculation of culture fluid into eggs and inspecting the CAMs after incubation at 36°C. for the characteristic "pin-point" HSV lesions. The CAMs from specimens initially inoculated into eggs were likewise examined and, if negative, the CAMs were ground and re-passed into fresh eggs before the specimens were declared negative.

It has been observed (McDonald, 1966) that if CAMs are inspected at 7 rather than at 2 days, large necrotic lesions 3 to 5 mm. in diameter may occur with strains of virus isolated from patients with genital herpes, whereas lesions from strains from patients with extra-genital herpes remain typically small. Accordingly all isolates, including those originally identified in HeLa cell

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cultures, together with ten strains of HSV derived from extra-genital herpes infections from patients attending other departments of St. Thomas’ Hospital, were inoculated into eggs which were harvested both at 2 and at 7 days.

Results

Herpes simplex virus was isolated from 23 (38 per cent.) of the sixty patients, 21 males and two females (Table I), whose ages ranged from 20 to 42 years. All but three men (Cases 4, 11, and 20) were uncircumcised (approximately 60 per cent. of all patients attending the clinic were found to be uncircumcised). Eight (34 per cent.) of the 23 patients from whom HSV was isolated gave a history of recurrent genital lesions, although only Case 11 gave a classical history of herpes labialis. It will be noted that some of the patients had classical grouped vesicles while others exhibited either pustules or ulcers which were presumably ruptured vesicles. The patient with pubic vesicles (Case 4), although not strictly a case of genital herpes according to the above definition, was a promiscuous male whose lesions appeared during the course of treatment for gonorrhoea.

The likelihood of virus isolation appeared to depend more upon the duration of the lesion than its macroscopic appearance, for most lesions from which HSV were isolated, whether vesicles or ulcers, had been present for one week or less. Of 23 isolates made in HeLa cell cultures, CPE was usually evident by the third day, but on three occasions (Cases 6, 20, and 22) it was detected as early as 24 hours after inoculation. Of the fourteen isolates initially detected in eggs, only one required additional passage.

Although CAM lesions from genital and extra-genital strains appeared typical and identical at 2 days, by 7 days all the genital strains had produced large necrotic lesions, whereas nine of ten of the extra-genital strains showed little change from the small lesions seen at 2 days (Fig. 1, overleaf).

Table II (overleaf) lists the clinical diagnoses and size of lesions on CAMs from ten patients with extra-genital herpes (Cases A to J).

### Table I

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Age (yrs)</th>
<th>Sex</th>
<th>Nationality</th>
<th>Marital Status</th>
<th>Lesions</th>
<th>Duration (days)</th>
<th>Consort</th>
<th>Lesions on CAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>27</td>
<td>M</td>
<td>British</td>
<td>M</td>
<td>Indurated corona ulcers</td>
<td>5</td>
<td>Casual female</td>
<td>Large</td>
</tr>
<tr>
<td>2</td>
<td>25</td>
<td>M</td>
<td>B.W.I.</td>
<td>M</td>
<td>Shallow preputial ulcers</td>
<td>3</td>
<td>Wife</td>
<td>Large</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
<td>M</td>
<td>British</td>
<td>M</td>
<td>Genital vesicles (recurrent)</td>
<td>7</td>
<td>Female friend</td>
<td>Large</td>
</tr>
<tr>
<td>4</td>
<td>20</td>
<td>M</td>
<td>British</td>
<td>S</td>
<td>Pubic vesicles</td>
<td>7</td>
<td>Female friend</td>
<td>Large</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td>M</td>
<td>British</td>
<td>M</td>
<td>Preputial ulcers and oedema</td>
<td>10</td>
<td>Wife</td>
<td>Large</td>
</tr>
<tr>
<td>6</td>
<td>24</td>
<td>M</td>
<td>British</td>
<td>S</td>
<td>Subpreputial ulcers</td>
<td>7</td>
<td>Wife</td>
<td>Large</td>
</tr>
<tr>
<td>7</td>
<td>26</td>
<td>M</td>
<td>British</td>
<td>S</td>
<td>Coronal ulcers (recurrent)</td>
<td>3</td>
<td>Female friend</td>
<td>Large</td>
</tr>
<tr>
<td>8</td>
<td>33</td>
<td>M</td>
<td>Asian</td>
<td>S</td>
<td>Healing penile ulcers (recurrent)</td>
<td>Not certain</td>
<td>Female friend</td>
<td>Large</td>
</tr>
<tr>
<td>9</td>
<td>31</td>
<td>M</td>
<td>B.W.I.</td>
<td>M</td>
<td>Penile vesicles (recurrent)</td>
<td>Not certain</td>
<td>Casual female</td>
<td>Large</td>
</tr>
<tr>
<td>10</td>
<td>39</td>
<td>M</td>
<td>B.W.I.</td>
<td>S</td>
<td>Coronal vesicles</td>
<td>7</td>
<td>Female friend</td>
<td>Large</td>
</tr>
<tr>
<td>11</td>
<td>42</td>
<td>M</td>
<td>British</td>
<td>M</td>
<td>Penile vesicles</td>
<td>Not certain</td>
<td>Wife</td>
<td>Large</td>
</tr>
<tr>
<td>12</td>
<td>25</td>
<td>F</td>
<td>Australian</td>
<td>S</td>
<td>Ulcer labium major</td>
<td>2</td>
<td>Male friend</td>
<td>Large</td>
</tr>
<tr>
<td>13</td>
<td>29</td>
<td>M</td>
<td>British</td>
<td>S</td>
<td>Coronal ulcers (recurrent)</td>
<td>3</td>
<td>Homosexual</td>
<td>Large</td>
</tr>
<tr>
<td>14</td>
<td>38</td>
<td>M</td>
<td>Polish</td>
<td>M</td>
<td>Preputial vesicles</td>
<td>1</td>
<td>Wife</td>
<td>Large</td>
</tr>
<tr>
<td>15</td>
<td>21</td>
<td>M</td>
<td>B.W.I.</td>
<td>S</td>
<td>Coronal vesicles and ulcers</td>
<td>4</td>
<td>Female friend</td>
<td>Large</td>
</tr>
<tr>
<td>16</td>
<td>23</td>
<td>M</td>
<td>B.W.I.</td>
<td>S</td>
<td>Coronal ulcers</td>
<td>7</td>
<td>Male friend</td>
<td>Large</td>
</tr>
<tr>
<td>17</td>
<td>24</td>
<td>M</td>
<td>British</td>
<td>M</td>
<td>Preputial ulcers (recurrent)</td>
<td>Not certain</td>
<td>Wife</td>
<td>Large</td>
</tr>
<tr>
<td>18</td>
<td>28</td>
<td>M</td>
<td>British</td>
<td>M</td>
<td>Preputial vesicles and papules</td>
<td>7</td>
<td>Female friend</td>
<td>Large</td>
</tr>
<tr>
<td>19</td>
<td>25</td>
<td>M</td>
<td>Asian</td>
<td>S</td>
<td>Preputial pustules</td>
<td>1</td>
<td>Female friend</td>
<td>Large</td>
</tr>
<tr>
<td>20</td>
<td>41</td>
<td>M</td>
<td>British</td>
<td>S</td>
<td>Healing penile vesicles (recurrent)</td>
<td>Not certain</td>
<td>Prostitute</td>
<td>Large</td>
</tr>
<tr>
<td>21</td>
<td>32</td>
<td>M</td>
<td>B.W.I.</td>
<td>S</td>
<td>Penile ulcers</td>
<td>14</td>
<td>Homosexual</td>
<td>Large</td>
</tr>
<tr>
<td>22</td>
<td>22</td>
<td>F</td>
<td>B.W.I.</td>
<td>S</td>
<td>Vulvar and vaginal ulcers</td>
<td>3</td>
<td>Male friend</td>
<td>Large</td>
</tr>
<tr>
<td>23</td>
<td>40</td>
<td>M</td>
<td>British</td>
<td>S</td>
<td>Penile vesicles (recurrent)</td>
<td>5-7</td>
<td>Female friend</td>
<td>Large</td>
</tr>
</tbody>
</table>
In view of these findings, the CPE of both genital and extra-genital strains was studied in HeLa, WI-38, and RK13 cultures. No difference in CPE between strains was found. Electron microscopy of three genital and three extra-genital strains revealed typical herpes-like virus particles (Fig. 2, opposite). All strains examined were morphologically identical.

Histological study of CAM lesions caused by strains of HSV from genital lesions revealed an ulcerated epithelium with marked round cell infiltration, giant cell formation, and capillary proliferation. Examination of CAM lesions caused by extra-genital HSV revealed no ulceration, minimal round cell infiltration, and capillary proliferation, but no giant cells.

**Discussion**

This series shows that clinical cases of herpes genitalis are not uncommon. Records examined during the course of this investigation revealed that
the incidence of virologically proven herpes genitalis approximated to that of primary syphilis. Barile, Blumberg, Kraul, and Yaguchi (1962), in an investigation of 35 patients with penile lesions in the U.S. Army in Japan, found that HSV was the most commonly encountered aetiological agent. As in our series, the majority of these patients (91 per cent.) were uncircumcised.

It is probable that many of the lesions in our series from which no virus was isolated were caused by HSV, but the long duration of many of them precluded virus isolation. This is broadly in agreement with the findings of Hutfield (1966).

There was a low incidence of herpes genitalis in females in this series. This may in part be due to the fact that they are less likely to notice lesions than men. Vulval lesions are more common than vaginal or cervical lesions (King and Nicol, 1964), but since HSV is rapidly inactivated below pH 7.0 (Munk and Ackermann, 1953; Farnham and Newton, 1959), the environment of the healthy vagina (pH 4.5) is unlikely to be suitable for virus replication. However, in a survey of genital herpes in 64 women,
Josey, Nahmias, Naib, Utley, McKenzie, and Coleman (1966) found that cervical lesions accounted for 46 per cent. of the lesions from which HSV was isolated. In these cases the cervix was often oedematous, bleeding on slight trauma. Less often, large punched-out or multiple superficial ulcers were also seen.

Only one extra-genital strain, from Patient C, a married woman aged 23 with recurrent herpetic lesions on the right middle finger, produced large necrotic “genital-type” lesions on the CAM. The possibility that this was derived from an inoculum from a genital lesion is, of course, speculative.

There have been no previous published reports of the marked morphological difference between the lesions which genital and extra-genital HSV strains produce on the CAM*. Although both genital and extra-genital lesions are clinically similar in appearance, and no difference in CPE or virus morphology could be demonstrated, it is possible that strains of HSV that cause genital lesions may differ antigenically from other strains.

Serological studies, notably kinetic neutralization tests, have revealed various antigenic types of HSV. (Schneweis, 1962; Ashe and Scherp, 1963). Similar studies on representative strains of HSV isolated in this study are in progress and will be reported later.

Summary

Herpes simplex virus was isolated from 23 (38 per cent.) of sixty patients with herpes genitalis. A history of recurrent lesions was common, and uncircumcised patients were more frequently involved. Genital herpes was detected in only two females in this series. Viruses isolated from patients with herpes were found to produce atypical large necrotic lesions when inoculated onto the chorio-allantoic membrane (CAM) of developing chick embryos. Viruses from extra-genital herpetic lesions, with one exception, produced classical small herpetic lesions on the CAM. No difference in cytopathic effect or virus morphology could be detected between genital and extra-genital strains.

We are indebted to Mrs J. D. Almeida for electron microscope studies; to Dr J. R. Tighe for examination of histological material; to Mrs M. E. Spence for invaluable technical assistance; and to Dr C. S. Nicol for permission to study the patients under his care.

* Since this paper was submitted, D. C. Hutchfield (Acta derm.-venereol. (Stockh.), 1967, 47, 119) has also reported variations in size of CAM lesions produced by HSV derived from genital and extra-genital sources.

REFERENCES


L’herpès génital. Étude clinique et virologique

Résumé

Le virus de l’herpès simplex a été isolé de 23 des 60 malades (38 pour cent) atteints d’herpès génital. Un historique de lésions répétées avait été fréquent, et les maladies non-circinçis avaient été attaqués plus souvent. L’herpès génital a été découvert chez deux femmes seulement de cette série. On a trouvé que les virus isolés des malades atteints d’herpès avaient produit des grandes lésions nécrotiques atypiques quand ils avaient été inoculés à la membrane chorio-allantoïde des embryons du poulet en développement. Les virus provenant des lésions herpétiques extra-génitales avaient produit des petites lésions herpétiques classiques sur la membrane chorio-allantoïde sauf dans un cas seulement. Aucune différence dans l’effet cytopathique ou dans la morphologie des virus n’a pu être démontrée entre les souches génitales et extra-génitales.