



## Blood and body fluid splashes during surgery – the need for eye protection and masks

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### ABSTRACT

**INTRODUCTION** While most surgeons make an effort to avoid needlestick injury, some can pay little attention to reduce the potential route of infection occurring when body fluids splash into the eye. It has been shown that transmission of HIV, hepatitis B or C can occur across any mucous membrane. This study aims to quantify how frequently body fluids splash the mask and lens of wrap around protective glasses thus potentially exposing the surgeon to infection.

**PATIENTS AND METHODS** A prospective study was carried out by a single surgeon on all cases performed over a 1-year period. Protective mask and glasses were examined before and after operations.

**RESULTS** A total of 384 operations were performed with 174 (45%) showing blood or body fluid splash on the lens. A high incidence of splashes was found in vascular surgical procedures (79%). All amputations showed splash on the protective lens. Interestingly, 50% of laparoscopic cases resulted in blood or body fluid splash on the protective lens.

**CONCLUSIONS** This study has shown a high incidence (45%) of blood and body fluid splashes found on protective glasses and masks. There was a very high incidence (79%) during vascular surgical procedures. With the prevalence of HIV and hepatitis increasing, it seems prudent to protect oneself against possible routes of transmission.

### KEYWORDS

HIV – Eye protection – Blood splash

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In 2005, an estimated 53,000 people living in the UK were infected with HIV of whom 14,300 (27%) were unaware of their infection.<sup>1</sup> The prevalence of HIV among injecting drug users in England and Wales has also been increasing in recent years with 1 in 65 injectors being infected and in London this figure is even more alarming at 1 in 25.<sup>2</sup> It is estimated that at least half of these injecting drug users are unaware of their infection.<sup>2</sup>

Although the risk of HIV transmission through accidental exposure is low, it is still a risk at 0.5% for needlestick injury with percutaneous hollow-bore needles and 0.1% for mucous membrane exposure.<sup>5</sup> HIV contamination has also been reported by healthcare workers from bodily fluid splash to the eye.<sup>4</sup>

Surgical emergencies present with at least the same frequency in those with HIV or hepatitis B or C as in those without, and drainage of a septic focus is more common in HIV-positive admissions.<sup>5</sup> Surgeons are at risk from hepatitis and HIV while operating and, although most surgeons take precautions to avoid needlestick injuries, few pay close attention to the potential route of infection that occurs when body fluids splash into the eye.

The aim of this study was to investigate the incidence of blood and body fluid splash to a general surgeon.

### Patients and Methods

All operations performed by a single surgeon (specialist registrar, year 2) over a 1-year period were recorded prospectively. Wrap-around clear-lens glasses (Oakley half jackets®, with clear lens) and an operating mask (Technol – The Lite one, Kimberley Clark) were worn for all operations. A record of blood and body fluid splash on the lens of the glasses and on the mask was made. The lens was held in front of a plain white piece of paper to aid visualisation of all blood and body fluid splash before and after all procedures. Masks were closely inspected for any sign of contamination at the end of a procedure. The following were recorded: the nature of operation, the role during operation (surgeon or assistant), the operative time, the lens affected and whether the contamination was noticed intra-operatively. Between operations lenses were cleaned with an alcohol-soaked swab (Steret pre-injection

**Table 1 Blood and body fluid exposure in surgical procedures**

| Operation type | Number of cases (%) | Blood/body fluid splash (%) |           |
|----------------|---------------------|-----------------------------|-----------|
|                |                     | Glasses                     | Mask      |
| General        | 138 (36)            | 36 (26)                     | 19 (14)   |
| Vascular       | 103 (27)            | 81 (79)                     | 48 (47)   |
| Breast         | 70 (18)             | 30 (43)                     | 17 (24)   |
| Colorectal     | 31 (8)              | 6 (19)                      | 3 (10)    |
| Endocrine      | 24 (6)              | 12 (50)                     | 3 (13)    |
| Laparoscopic   | 18 (5)              | 9 (50)                      | 3 (17)    |
| Total          | 384 (100)           | 174 (45.2)                  | 93 (24.2) |

swab: Seton Healthcare Group plc) to ensure lenses were clean before each procedure.

## Results

A total of 384 operations were performed between 1 November 2004 and 31 October 2005. Table 1 summarises the incidence of blood and body fluid lens contamination according to operation type.

Of the vascular operations performed (Table 2), 23 were amputations (digits, below-knee amputations and above-knee

**Table 2 Blood and body fluid exposure during vascular cases**

| Operation type | Number of cases (%) | Blood/body fluid splash (%) |         |
|----------------|---------------------|-----------------------------|---------|
|                |                     | Glasses                     | Mask    |
| Amputation     | 23 (22)             | 23 (100)                    | 18 (78) |
| Aortofemoral   | 3 (3)               | 3 (100)                     | 3 (100) |
| CEA            | 19 (18)             | 12 (63)                     | 2 (11)  |
| AAA            | 17 (17)             | 13 (76)                     | 13 (76) |
| AV – fistula   | 8 (8)               | 5 (63)                      | 0 (0)   |
| CAPD catheter  | 10 (10)             | 5 (50)                      | 3 (33)  |
| Embolectomy    | 3 (3)               | 3 (100)                     | 1 (33)  |
| Femero distal  | 3 (3)               | 0 (0)                       | 1 (33)  |
| Iliofemoral    | 6 (6)               | 5 (83)                      | 3 (50)  |
| Varicose veins | 11 (11)             | 8 (73)                      | 3 (27)  |
| Total          | 103 (100)           | 81 (79)                     | 48 (47) |

amputations), and in all of these cases there was blood/body fluid splash present on the lens of the protective glasses.

Blood/body fluid was only noticed intra-operatively on the lens of the protective glasses in 87 (50%) cases. In none of the laparoscopic cases was blood or body fluid splash noticed until inspection of the protective glasses postoperatively.

Blood/body fluid was found on the mask after 93 (24%) operations. In all cases where there was blood/body fluid found on the mask, there was also blood/body fluid found on the lens of the protective glasses.

When the operating time exceeded 30 min (273 operations), 153 (56%) examinations showed blood/body fluid present on the lens of the protective glasses.

When operating as the primary surgeon (225 operations), there were 104 (46%) instances of blood/body fluid on the lens. When assisting at an operation (159 operations) there were 70 (43%) instances of blood/body fluid on the lens. Blood/body fluid was found on the left lens in 77 (44%) and on the right lens in 89 (51%) and on both lenses in 8 (6%).

## Discussion

This study demonstrates an overall 45% risk of blood and body fluid splash on protective spectacle lens during surgery. This agrees with previous studies where blood splash contamination recorded on spectacles and protective eye shields has varied from 25–51%.<sup>6–8</sup> This study has shown significantly more incidents of blood and body fluid splash when undertaking vascular operations and amputations. Additionally, it was also shown that in elective operations lasting for more than 2 h there was significantly greater contamination.<sup>8</sup>

Blood and body fluid splash on masks were recorded less frequently than on the lens of protective glasses (24% versus 45%). It is likely that this is because it is more difficult to visualise the smaller droplets on a coloured mask than it is on the lens held against a white background.

Vascular surgery by its nature does expose a surgeon to blood splash frequently. In performing amputations using bone cutters and power saws, blood and body fluids are often sprayed into the operating field and theatre as an airborne mist. When vascular anastomoses are inspected, a fine jet of blood may occur in a direction that cannot be predicted.

Laparoscopic surgery was anticipated to have a lower incidence of blood/body fluid splash given that any bleeding and handling of tissues occurs within the abdomen. However, this was not the case and it is likely that most exposure to projectile blood and body fluid in laparoscopic cases occurs towards the end of a case when ports are removed and pneumoperitoneum is released via the port sites.

The primary surgeon and their assistants were shown to be equally at risk of blood and body fluid splash to their eyes. These blood and body fluid splash episodes are often unnoticed intra-operatively.

In wearing protective glasses and an operating mask, two potential routes of viral transmission from patient to surgeon are combated. In this study, using wrap-around style glasses, there were no incidences of blood or body fluid splash found on the inside of the protective glasses as previously shown by Brearley and Buist.<sup>6</sup> Wearing regular spectacles does offer limited protection but it has been demonstrated that there is up to a 5% rate of contamination on the protective side flaps of glasses and these side flaps are not present on regular, everyday spectacles.<sup>9</sup>

The prevalence of HIV and hepatitis is increasing; therefore, although the transmission risk of HIV and hepatitis is low,<sup>5</sup> the overall risk cannot be ignored. In a prospective epidemiological study performed on patients undergoing invasive radiological procedures in France, 944 patients were screened for hepatitis C virus. Ninety-one patients (10%) tested positive for hepatitis C, of whom 82 (90%) had a positive viraemia result demonstrating a high potential for contamination through blood contacts.<sup>10</sup>

## Conclusions

Given that HIV and hepatitis may be transmitted across any mucous membrane, it seems prudent that surgeons should protect themselves against all possible route of transmission. We recommend the routine wearing of wrap-around protective glasses and masks during all surgical operations in order to protect the wearer against blood or body fluid contamination.

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