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The use of the Cell Saver in transoral maxillofacial surgery: a preliminary report

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SUMMARY. **In a prospective study with 18 patients, the Cell Saver was used in transoral operations. Blood cultures were taken immediately before retransfusion, 15 min, 2 and 24 h after retransfusion. As a clinical consequence we noticed a higher increase in temperature because of the transient bacteraemia. Other negative clinical consequences were not observed. If adequate antibiotic prophylaxis is used with careful patient selection, we think that the Cell Saver can even be used in transoral operations, although the number of observations is too small to allow definitive conclusions.**

KEY WORDS:
Cell Saver – Transoral operations – Bacteraemia – Maxillo-facial surgery

INTRODUCTION

There are various methods of avoiding transfusion-related hepatitis or HIV infection. In the Department of Maxillo-Facial Surgery, University Hospital Zürich we use predeposited blood, hypotension, normovolaemic haemodilution and the Cell Saver. The Cell Saver is indicated in cases, when there is no autologous blood available and when a blood loss between 1000 and 1500 ml is expected.

The Cell Saver, an autologous red cell recovery system, uses a special double lumen tube, through which the aspirated blood is immediately mixed with a heparin solution. This blood is then sampled in a cardiotomy reservoir, equipped with a gross filter.

When enough blood has been collected, it is pumped into a spinning centrifuge bowl. The heaviest components, the erythrocytes, are separated, while the plasma, the free haemoglobin and cell stroma flow to the waste bag. The blood is retransfused through a microfilter.

The use of the Cell Saver has until now been contraindicated in infected areas as well as in tumour operations. In the literature, only a few articles can be found on the use of the Cell Saver in tumour operations. (*Klimberg* et al., 1986; *Thurer* and *Hauer*, 1982).

MATERIAL AND METHODS

In a prospective study, we have used the Cell Saver 3 plus apparatus in transoral operations since 1989 in 18 patients aged between 16 and 66 years.

Patients with risk factors, such as endocarditis, valvular heart disease, and artificial heart valves were excluded.

On the day of operation, patients clean their teeth by brushing with a chlorhexidine solution (0·2%). All the patients received prophylactic antibiotic therapy, in 13 cases with clindamycin and in 5 cases with co-trimoxazole (trimethoprim and sulfamethoxazole). Aerobic and anaerobic blood cultures were taken immediately before retransfusion, 15 min, 2 h and 24 h after retransfusion using the Liquoid blood culture bottles TSB and BHI from the Hoffmann–La Roche AG, D-7889 Grenzach–Wyhlen. A quantitative evaluation of the blood coming from the retransfusion bag was undertaken. In order to compare the clinical parameters, we used a group of 18 patients submitted to comparable operations and transfused with homologous blood.

RESULTS

Most of the patients received between 1 and 10 million bacteria (Table 1). This number results from a multiplication of the counted bacteria per millilitre and the quantity of the retransfused blood.

In 3 patients, the quantitative evaluation of the retransfusion blood showed only a few bacteria. In 2 patients, we performed a combined extra- and intraoral operation. In these patients the quantitative measurements represent the first partition of the collected blood that mainly originated from extraoral

Table 1 – Number of bacteria inoculated

Estimated number of inoculated bacteria	Number of patients
— 100000	3
— 1000000	4
— 10000000	10
Over 10000000	1

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viridans and Neisseria species; gram-negative rods were isolated from the blood of 3 patients (Table 3).

Two hours after retransfusion there was only one positive blood culture with streptococcus viridans and Neisseria species and 24 h after retransfusion all the blood cultures remained sterile. Clinically, in both groups of patients an increase in temperature within the first 12 h postoperatively, was observed. In the group of patients with Cell Saver blood a clearly higher increase in temperature than in patients with homologous blood transfusion could be seen. An increase in temperature over 39 °C was noticed in 5 patients with retransfusion and in 1 patient with transfusion of homologous blood. In 3 of these 5 patients gram-negative rod shaped bacteria (Citrobacter freundii, Hafnia alvei and in one case no further-specified gram-negative rods) were found in the blood culture 15 min after retransfusion. On the first postoperative day, there was no further difference between the two groups (Fig. 2). We observed only one case, where the temperature increase lasted 3 days.

Any other complications such as abscesses, bronchopneumonia etc. were not observed. Using the Cell Saver enabled us to re-use an average of 40% of the blood lost and therefore between 1 and 4 (on average 2) homologous blood transfusions could be avoided.

DISCUSSION AND CONCLUSIONS

In the literature, the use of the Cell Saver in contaminated cases is not recommended. *Boudreaux* et al. (1983) have shown, that by the washing procedure, a diminution of bacteria by up to 77–95% could be achieved, although multiple washing procedures could not eliminate all the bacteria. *Griswold* and *Ortner* (1943) and *Glover* et al. (1978) reported deaths after massive contaminations in injured bowel perforations. *Griswold* and *Ortner* (1943) lost 1 patient who had received 2000 ml of contaminated blood after the filtration mechanism had failed (the infusion needle being obstructed by faeces).

Timberlake and *McSwan* (1988) recommended the use of Cell Saver blood even in patients with gastrointestinal perforations if there is no banked blood available and broad spectrum antibiotic prophylaxis is prescribed. These authors reported that out of 11 patients with enteric contaminated blood, 3 patients presented with a infectious wound complication, 'one probably nosocomial from the intensive care unit'. No deaths occurred. In animal experiments *Klebanoff* et al. (1970) and *Smith* et al. (1978) have shown that intestinal contamination is tolerated up to a certain degree. In severe contaminations, *Smith* et al. (1978) pointed out that prophylactic antibiotic therapy improved the results remarkably.

Durand et al. (1989) observed in 90% positive Staphylococcus epidermis haemocultures, clinically irrelevant, in the retransfusion bag, when they used the Cell Saver during caesarean section of 15 parturiants. *Schwieger* et al. (1989) used the Cell Saver in 19 patients who underwent coronary bypass (n = 15) or valve replacement (n = 3) or both (n = 1). In 4 patients, positive cultures from the waste bag fluid were found without infective complications during their hospital stay. In their study, the fluid from the waste bag was used. According to an experimental study of *Boudreaux* et al. (1983) in light degrees of bacterial contamination with *Escherichia coli*, there are comparable numbers of bacteria in the saline-washed red cells and the effluent saline wash fluid.

Kang et al. (1991) observed positive cultures in the retransfusion bag (aerob. 6, anaerob. 2) in 8 of 28 samples of 14 patients undergoing orthotopic liver transplantation. All positive cultures showed occasional to rare coagulase-negative Staphylococcus epidermidis. All cultures taken from the patients within 1 week remained sterile. No infections were observed.

Our study showed that contamination of transfused blood is well tolerated by the patients, although the number of bacteria in our study was much higher than in the above-mentioned studies. A temperature increase over 39 °C was observed in all patients where gram-negative rods were isolated. Because of this, we recommend antibiotic prophylaxis consisting of a combination of an aminoglycoside with clindamycin. The aminoglycoside may be given as a single dose. Of course there are only a few patients in this study. The number of inoculated bacteria has been estimated, because in some cases we had to retransfuse the blood in several portions. In these cases, the blood for the quantitative measurements was taken from the first portion, and the following portions were not tested further, because of limited laboratory capacity. In the two cases with a combined intra- and extraoral approach the first specimens came from that portion containing predominantly the extraorally-saved blood, so that the number and the type of inoculated bacteria is not representative of the totality of the inoculated bacteria.

Another problem is the time between collecting the blood and the retransfusion, rising sometimes to 3 h, when the blood loss is low and therefore blood collection is insufficient. The blood then stays in the reservoir at room temperature and the bacteria can multiply.

We believe that the patients are familiar with some of the bacteria which are inoculated with the retransfused blood. As we know, tooth extraction leads to a transient bacteraemia in 100%, scaling of teeth in 50% (*Heimdahl*, 1989) and even chewing hard food or brushing the teeth can cause a bacteraemia. That means that the intact immunological system is adapted to protect patients without risk factors like prosthetic devices or valvular heart disease against a number of commensal micro-organisms. Perhaps this is an explanation for the good tolerance to the iatrogenic bacteraemia we produced in these patients. Until now there are not enough observation data to allow definitive conclusions.

Table 2 – Most common bacteria in retransfusion bag (n = 18)

Streptococcus viridans	15
coagulase-negative Staphylococci	14
Neisseria sp.	12
Staphylococcus aureus	6
Haemophilus sp.	5
Corynebacterium sp.	5

procedure. The third patient was operated on for a haemangioma. This operation lasted only a short time, but during this time we had severe bleeding, so that we were able to save the blood with a minimum of contamination. In the patient, who received more than 10 million bacteria a bimaxillary operation was performed. 815 ml were retransfused and more than 15000 bacteria per millilitre were counted.

All the blood cultures we took from the patient just before the retransfusion showed no bacterial growth.

Table 3 – Bacteria in positive blood cultures 15 min after retransfusion (n = 15)

Streptococcus viridans	10
Neisseria sp.	7
Staphylococcus coagulase-neg.	1
Enterococci	1
Citrobacter freundii	1
Hafnia alvei	1
gram-neg. rod-shaped bacteria (not further specified)	1
Moraxella	1
various anaerobic bacteria	1

The most common bacteria in the retransfusion bag were streptococcus viridans, coagulase-negative staphylococci and Neisseria species (Table 2). Bacteria were cultured from the blood of 15 patients 15 min after retransfusion. Most common were streptococcus

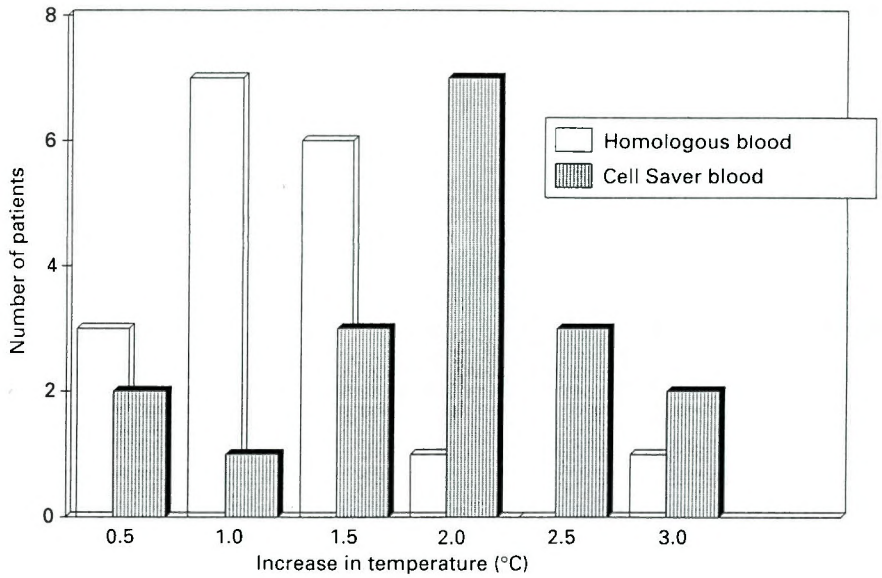


Fig. 1 – Increase in temperature within 12 h postoperatively.

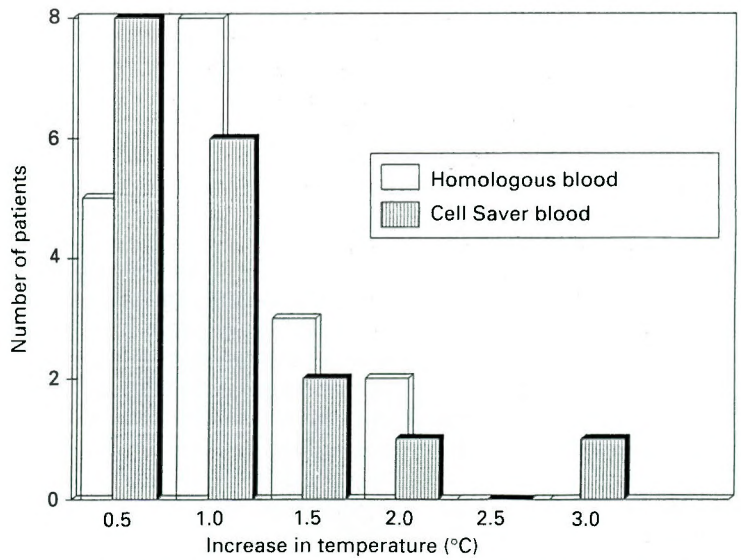


Fig. 2 – Increase in temperature on the first postoperative day.

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Cleft palate repair: Furlow versus von Langenbeck

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SUMMARY. **The Furlow cleft palate repair using a double opposing Z-plasty appears to be very promising. In order to detect advantages and disadvantages concerning the technique as well as speech- and hearing results, the Furlow palatoplasty was compared with the classical von Langenbeck technique. Data analysis from 10 children in both groups revealed that the Furlow technique proved to be superior to the von Langenbeck technique as far as speech sound is concerned: at a mean age of 3·5 years, nasality and nasal escape were absent in almost all cases. However, there were no significant differences between the techniques in respect of articulatory skills, language comprehension, language production as well as hearing. Technically, the Furlow technique is more difficult to perform, particularly in wide clefts.**

KEY WORDS:
Cleft palate – Furlow palatoplasty – Speech and hearing

INTRODUCTION

In the Groningen University Clinic the traditional *von Langenbeck* palatoplasty is the method of choice for palatal closure. The operation is performed as a two-stage procedure: soft palate closure at the age of 10 months and hard palate closure at the age of 18 months. A problem frequently encountered is shortness of the palate resulting in a relatively high need for secondary pharyngoplasty: in a series of 101 patients 35 patients required a pharyngoplasty (*Spauwen* et al., 1990).

At least on a theoretical basis, the double opposing Z-plasty described by *Furlow* (1986) could overcome this problem, since the Z-plasties provide for lengthening, and the cross-over of the levator muscles creates a muscle sling. In the present prospective study, results of the von Langenbeck and the Furlow procedure were compared.

PATIENTS AND METHODS

In order to compare the *von Langenbeck* with the *Furlow* technique, it was hypothesized that 90% velopharyngeal competence would occur in the *Furlow* approach and 40% in the *von Langenbeck* approach (*Spauwen* et al., 1990). Based upon a power analysis using an α-factor of 0·5 and a β-factor of 0·2 10 patients in each group were needed. So, 20 children with any form of cleft palate were randomly allocated into two groups each of 10 children.

In both groups, a two-stage procedure was applied except in cases of a cleft of the soft palate only. The operations were performed by 2 surgeons. Up to now the patients were old enough for speech, language and hearing analysis.

In both groups, no differences were present concerning the distribution in the type of cleft (Table 1). The mean age at the first speech and hearing examination was 2·8 and 3·2 years respectively.

Speech examination

Three qualities of speech were tested: nasality, nasal escape and articulation. The tests were performed by two qualified speech pathologists, one from the medical and the other from the psychological disciplines. The speech was recorded on tape. The nasality was tested by the experienced ear of the examiners, judging from spontaneous speech, test sentences as well as from vowel production, including assessment of the effect of closing the nostrils by finger pressure. In some cases stethoscope tubing was used to detect nasal resonance as well as nasal escape. A four point scale was used to express the degree of nasality i.e. absent, mild, moderate or severe. The nasal escape

Table 1 – Distribution of type of cleft in the von Langenbeck and Furlow patient groups

Palatoplasty	von Langenbeck N1 = 10	Furlow N2 = 10
Type of cleft	UCLP 2 BCLP 2 CP 6	UCLP 3 BCLP 2 CP 5
Mean age at first examination	2·8 yrs	3·2 yrs

UCLP: unilateral cleft lip and palate; BCLP: bilateral cleft lip and palate; CP: cleft palate only

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