

## RETROSPECTIVE CLINICAL STUDY OF TRACHEOSTOMY IN ORAL AND MAXILLOFACIAL SURGERY ; 31 CASES

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*Tracheostomy may be used to assure airway protection in various clinical situation. It, as a known operation, has a history spanning 2000 years.*

*The first clear account of a successful tracheostomy was recorded in 1546 by Brasavola. Until 1718 the term "bronchotomy" was used to describe the procedure.*

*Heister then introduce the term "tracheotomy and this was later adopted and popularized by Trousseau about 1830.*

*The term "tracheostomy" appeared in medical literature after 1820 and the two terms "tracheostomy" and "tracheotomy" are used interchangeably today.*

*Indications include relief of upper airway obstruction, facilitation of pulmonary toilet, diminution of dead space and need for prolonged mechanical ventilation.*

*The extent of indication of tracheostomy has a tendency to increase, thus oral and maxillofacial surgeons have some opportunities to face a situation that require tracheostomy.*

*So, we reported retrospective study of 31 cases of tracheostomy patient in oral and maxillofacial surgery with reference review to reveal the significance of surgical skill and management capability of emergency state maxillofacial surgery patients.*

### I . INTRODUCTION

Tracheostomy may be used to assure airway protection in various clinical situations.

The first detailed references are provided by Aretaeus and Galen in the second and third centuries A.D.

The first clear account of a successful tracheostomy was recorded in 1546 by Brasavola<sup>1)</sup>. Until 1718 the term "bronchotomy" was used to describe the procedure. Heister then introduced the term, "tracheotomy" and this was later adopted and popularized by Trousseau about 1830. The term, "Tracheos-

tomyl" appeared in medical literature after 1820 and the two terms "Tracheotomy", "Tracheostomy" are used interchangeably today.

In general, the indications for tracheostomy may be classified as ;

(1) respiratory obstruction, (2) secretory retention, and (3) respiratory insufficiency<sup>1)</sup>. Oral and maxillofacial surgenons have some opportunities to face a situation that require tracheostomy due to increased maxillofacial trauma patients.

So, we reported retrospective study of 31 cases of tracheostomy patients in oral and maxillofacial surgery department for 5 years to reveal the significance

of surgical skill and management capability of emergency state maxillofacial patients.

## II. MATERIALS AND METHODS

Retrospective study of 31 patients who underwent tracheostomy was conducted from January, 1986 to July, 1990.

Distribution of causative diseases, age, sex, intubation or tracheostomy history, mental status before tracheostomy, related department, skin incision method, grade of operator, definite diagnosis before tracheostomy in trauma patients, arterial blood gas analysis (ABGA) performance before tracheostomy in trauma patients, type of anesthesia, urgency status, performed location, I. C. U. care, duration of cannulation after operation and complications are presented with reference review.

## III. RESULTS

### 1) Disease distribution (Table 1-1, 2, 3, 4)

31 cases were divided into six disease groups: maxillofacial trauma, T.M.J ankylosis, cancer, Pierre-Robins syndrome, Ludwig's angina, micrognathia.

The most frequent causative disease group

for the tracheostomy was maxillofacial trauma with 17 cases (55%).

9 cases (29%) were cancer, 2 cases (7%) were T.M.J ankylosis, Pierre-Robin syndrome, Ludwig's angina, micrognathia were 1 case (3%) respectively.

Among 17 maxillofacial trauma cases, only mandible fracture was the most with 7 cases (39%) and only zygoma fracture was the least with 1 case (6%). Mandible fracture combined with maxilla fracture cases were 4 (22%) cases, mandible fracture combined with zygoma fracture cases were 4 cases (22%) and only maxilla fracture cases were 2 cases (11%).

### 2) Sex ratio (Table 2.)

Sex ratio between male and female was 15:1 showing 29 cases (94%) in male and 2 cases (6%) in female.

### 3) Age distribution (Table 3.)

Tracheostomy was performed most frequently in 21-30 year age group showing 9 cases (28%). 41-50 year age group showed 6 cases (19%), 11-20 year age group showed 4 cases (13%), 31-40 year age group showed 4 cases (13%), 61-70 year age group showed 4 cases (13%), 51-60 year age group showed 2 cases (6%), below 10 year age group showed 1 case (4%)

Table 1-1. Disease distribution.

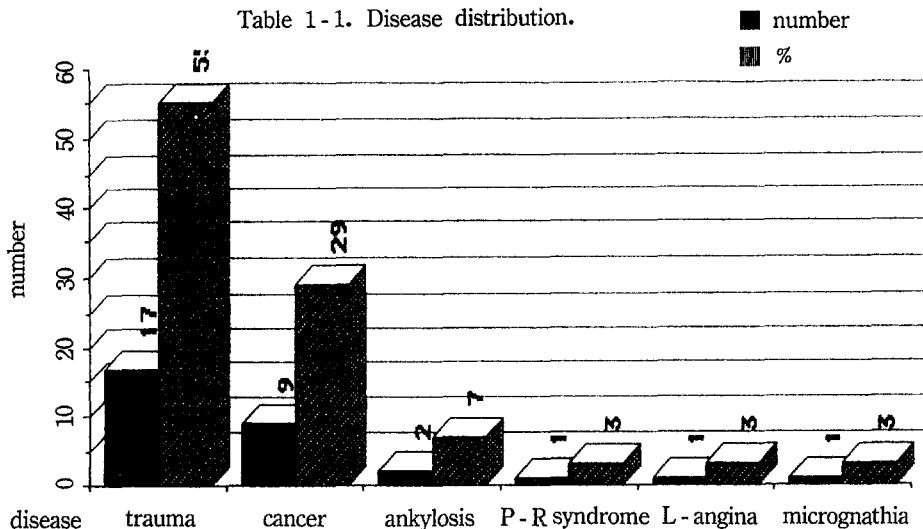


Table 1-2. Location of trauma.

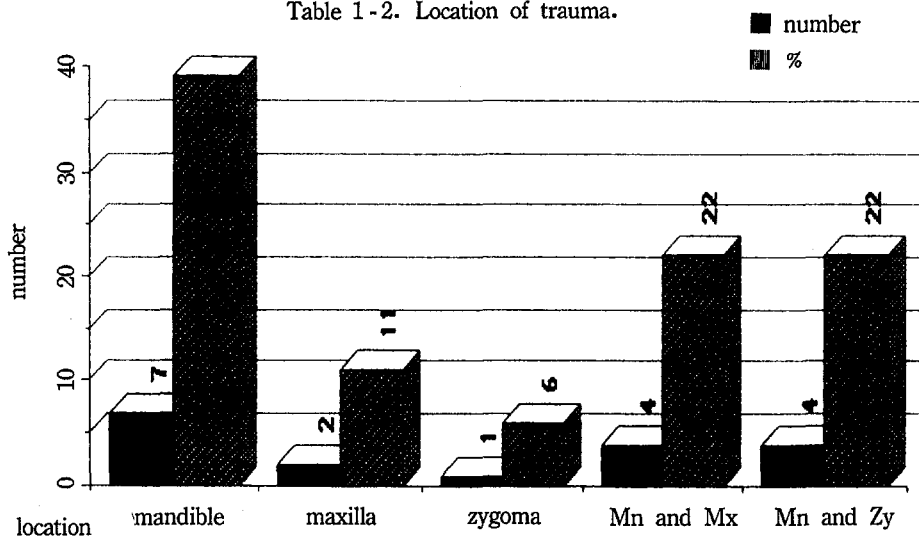


Table 1-3. Location of Mn fracturer in trauma.

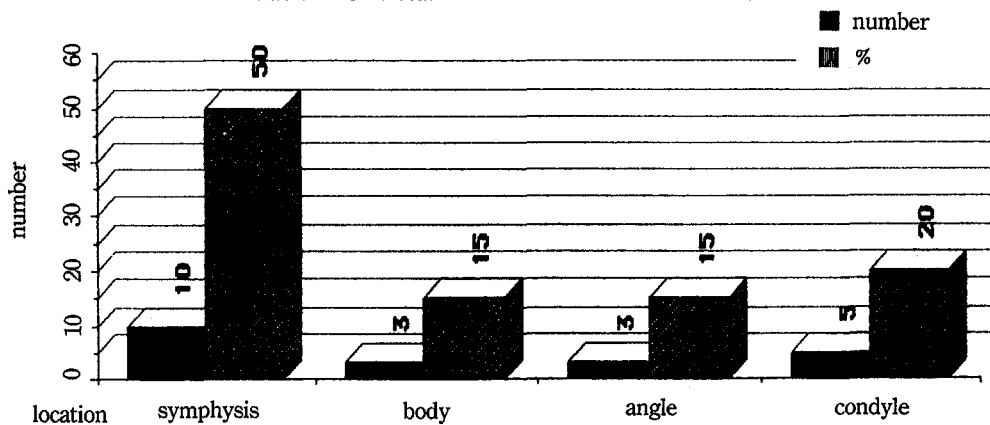


Table 1-4. Type of Mx fracture in trauma.

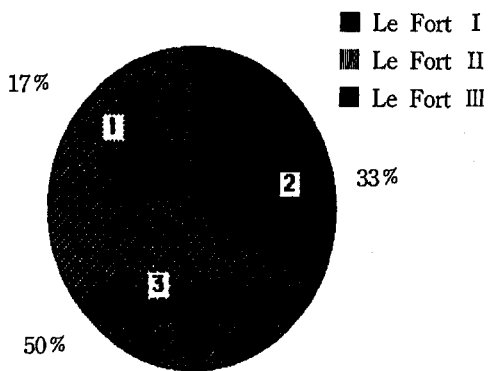


Table 2. Sex distribution.

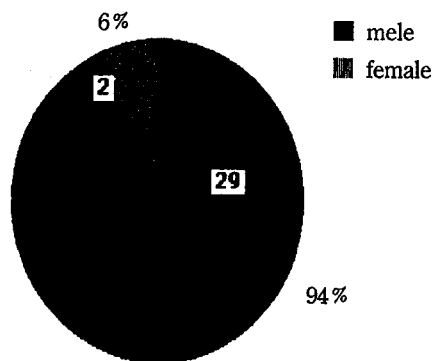


Table 3. Age distribution.

Disease	-10	11-20	21-30	31-40	41-50	51-60	61-70	71-	Total
Trauma	.	3	7	3	4	.	.	.	17
Cancer	.	.	.	.	2	2	4	1	9
Ankylosis (TMJ)	.	1	1	.	.	.	.	.	2
Pierre - Robins syn	1	.	.	.	.	.	.	.	1
Ludwig - angina	.	.	.	1	.	.	.	.	1
Micrognathia	.	.	1	.	.	.	.	.	1
Total	1(4%)	4(13%)	9(28%)	4(13%)	6(19%)	2(6%)	4(13%)	1(4%)	31

Table 4. Intubation or tracheostomy history.

Disease	Intubation	Tracheostomy	Total
Trauma	7	0	7
Cancer	8	1	9
Ankylosis(TMJ)	0	1	1
Pierre - Robins syn	1	0	1
Ludwigangina	0	0	0
Micrognathia	1	0	1
Total	17(55%)	2(6%)	19(61%)

and above 71 year age group showed 1 case(4%).

4) Intubation or tracheostomy history(Table 4)

19 cases(61%) had intubation or tracheostomy history.

Of them 17 cases(89%) had their airway secured by intubation - whether emergency or elective - prior to tracheostomy and 2 cases(11%) had previous tracheostomy history.

5) Mental state prior to tracheostomy in emergency (Table 5)

Drowsy mental state was showed in 6 cases(40%), stuporous mental state was showed in 6 cases(40%) and alert mental state was showed in 3 cases(20%).

6) Related medical department(Table 6)

Neurosurgery was the most with 11 cases(41%).

5 cases were related to orthopedic surgery, 3 cases were related to chest surgery, 2 cases were ophthalmology, 1 case was ENT and 1 case was urology.

They were all maxillofacial trauma cases.

7) Grade of doctor who performed tracheostomy (Table 7)

Tracheostomy was performed most frequently by first resident with 28 cases(90%). Second resident performed 2 cases and Intern performed 1 case.

8) Definite diagnosis by X-ray taking prior to tracheostomy in trauma patients(Table 8).

12 cases(71%) showed definite diagnosis by X-ray taking prior to tracheostomy, while 5 cases(29%) had taken tracheostomy without definite diagnosis by X-ray taking.

Table 5. Mental state prior to tracheostomy.

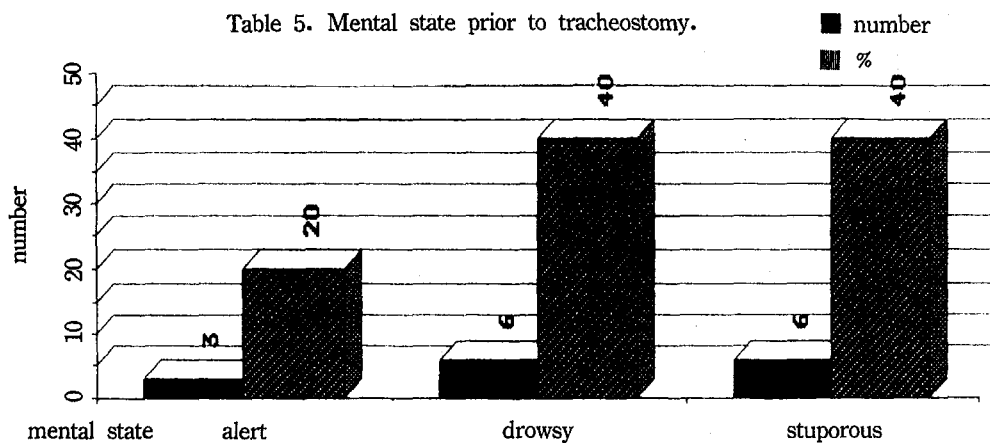


Table 6. Related medical departments.

Disease	NS	OS	CS	ED	ENT	URO
Trauma	11(41%)	5(19%)	3(11%)	2(15%)	1(7%)	1(7%)
Cancer	.	.	.	.	.	.
Ankylosis(TMJ)	.	.	.	.	.	.
Pierre - Robins syn	.	.	.	.	.	.
Ludwigangina	.	.	.	.	.	.
Micrognathia	.	.	.	.	.	.
Total	11(41%)	5(19%)	3(15%)	2(11%)	1(7%)	1(7%)

Table 7. Grade of doctor who performed tracheostomy.

Disease	Intern	first resident	second resident
Trauma	1	14	2
Cancer	.	9	.
Ankylosis(TMJ)	.	2	.
Pierre - Robins syn	.	1	.
Micrognathia	.	1	.
Total	1(3%)	28(91%)	2(6%)

Table 8. Definite diagnosis prior to tracheostomy.

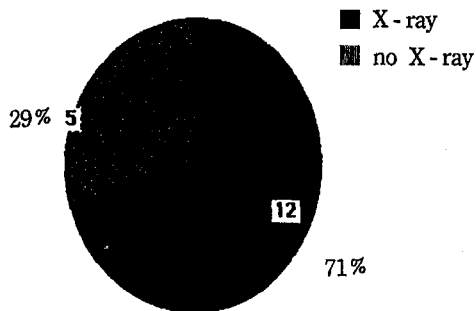


Table 9. Skin incision method.

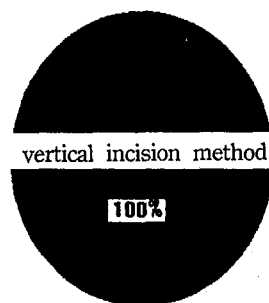


Table 10. ABGA prior to tracheostomy.

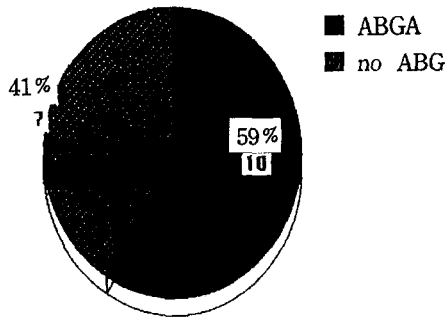


Table 11. Types of anesthesia.

Disease	Local	General
Trauma	15	2
Cancer	0	9
Ankylosis(TMJ)	1	1
Pierre - Robins syn	0	1
Micrognathia	0	1
<b>Total</b>	<b>17(55%)</b>	<b>14(45%)</b>

Table 12. Urgency status.

Disease	Elective	Emergency
Trauma	3	14
Cancer	9	0
Ankylosis(TMJ)	2	0
Pierre - Robins syn	1	0
Micrognathia	0	1
<b>Total</b>	<b>16(52%)</b>	<b>15(48%)</b>

Table 13. Performed location.

Disease	OR	ER	ICU	WD
Trauma	2	11	3	1
Cancer	9	.	.	.
Ankylosis(TMJ)	2	.	.	.
Pierre - Robine syn	1	.	.	.
Micrognathia	0	.	.	.
<b>Total</b>	<b>15(48%)</b>	<b>11(35%)</b>	<b>3(18%)</b>	<b>1(6%)</b>

9) Skin incision method(Tale 9)

All cases(100%) were performed by vertical skin incision method.

10) Arterial blood gas analysis(ABGA) prior to tracheostomy in trauma patients(Table 10)

ABGA was performed in 10 cases(59%) prior to tracheostomy, while ABGA was not performed in 7 cases(41%) prior to tracheostomy.

11) Type of anesthesia(Table 11)

17 cases(55%) were performed under local anesthesia, while 14 cases(47%) were performed under general anesthesia.

12) Urgency status(Table 12)

16 cases(52%) were considered elective, while 15 cases(48%) considered emergency.

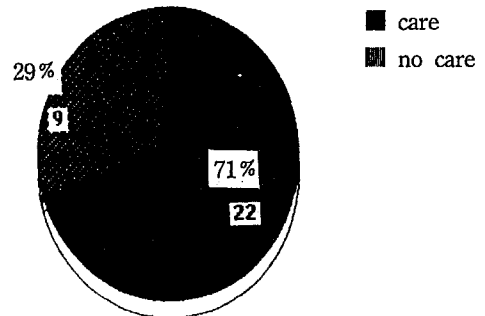
13) Performed location(Table 13)

Tracheostomy was performed most frequently in operating room with 15 cases(48%). 11 cases(35%) were performed in emergency room, 3 cases(18%) were performed in ICU and 1 cases(6%) was performed in ward.

14) ICU care after tracheostomy(table 14)

22 cases(71%) were cared in ICU, while 9 cases(29%) were not cared in ICU after tracheostomy.

Table 14. ICU care after tracheostomy.



15) Duration from operation to cannula removal(Ta-ble 15)

Decannulation was done most frequently on 6-8 th post operation day with 8 cases(24%). 5 cases(15%) showed decannulation on 9-11 th post operation day, 3 cases(9%) showed 3-5 th post operation day, 3 cases(9%) shwed 12-15 th post operation day, 3 cases(9%) showed 20-

Table 15. Duration from OP. to decannulation(Day).

Disease	-2	3-5	6-8	9-11	12-15	16-19	20-30	31-40	40-Permanent	Expire	
Trauma	·	1	3	2	1	2	3	·	1	1	3
Cancer	·	2	3	1	2	1	·	·	·	·	·
Ankylosis (TMJ)	·	·	2	·	·	·	·	·	·	·	·
Pierre -	·	·	·	1	·	·	·	·	·	·	·
Robins syn											
Microgna - gnathia	·	·	·	1	·	·	·	·	·	·	·
Ludwing - angina	·	·	·	·	·	·	·	·	·	·	1
Total	0	3(9%)	8(24%)	5(15%)	3(9%)	3(9%)	3(9%)	0	1(4%)	1(4%)	4(15%)

Table 16. Post op. complication.

Complication	Cases
Subcutaneous empysema	2(7%)
Pneumonia	2(7%)
Aspiration	2(7%)
Bronchiectaia	1(3%)
Stenosis	1(3%)
Obstruction	1(3%)
Vocal cord paralysis	1(3%)
Cannula dislodgement	1(3%)
Total	11(36%)

30 th post operation day, 3 cases(9%) showed 16-19 post operation day, 1 case(4%) showed above 41 st post operation day, 1 case(4%) showed permanent tracheostomy and 4 cases(12%) expired before decannulation.

16) Post OP. complication(Table 16)

8 groups of complications emerged in 11 cases (36%) and they are as follows : 2 cases(6%) subcutaneous emphysema, 2 cases(6%) pneumonia, 2 cases(6%) aspiration, 1 case(3%) bronchiectasia, 1 case(3%) stenosis, 1 case obstruction, 1 case(3%) vocal cord paralysis, 1 case(3%) cannula dislodgement.

Among them 3 cases(9%) - 2cases aspiration, 1 case obstruction - expired.

#### IV. DISCUSSION

Tracheostomy has been performed for acute airway management dating back as far as 100 BC, by Asclepiades, a Greek physician.

Presently tracheostomy is a common, relatively simple, often life saving procedure.

Indications included relief of upper airway obstruction, facilitation of pulmonary toilet, diminution of dead space, and need for prolonged mechanical ventilation<sup>4</sup>.

The extent of indications of tracheostomy has a tendency to increase, thus oral and maxillofacial surgeons have more opportunities to face a situation that require tracheostomy. Upper airway obstruction is the most common, most often occurring secondary to maxillofacial trauma. That is to say, among 6 disease group, trauma was the most frequent disease in oral and maxillofacial surgery, while neurologic or obstructive disease were the most frequent in medical reports<sup>5,6</sup>.

Among the trauma cases, mandible fracture was the most common(7 cases, 39%) and among them symphysis fracture was the most common.

This shows that symphysis fracture of mandible is frequently related with airway obstruction. Male female sex ratio was 15:1 and it is a high ratio, while medical reports shows from 1.5:1 to 2.4:1 of male female ratio<sup>5,6</sup>.

This result probably due to the trauma predominance in oral and maxillofacial surgery (all 17 cases of trauma were male).

Tracheostomy was performed most frequently 21-30 year age group, while it was most frequently performed below 10 year age group in medical reports.

This result probably due to the involvement of young adults in trauma (7 cases out of 9 cases 21-30 year group involved in trauma).

Intubation is more rapid airway maintenance method in emergency compared with tracheostomy if instruments are at hands. Even though intubation is more rapid method, tracheostomy was choiced in 8 cases (53%) out of 15 emergency cases and intubation was done in 7 cases prior to tracheostomy<sup>2)</sup>.

In mental state before tracheostomy, drowsy or stuporous mental state was showed in 12 cases (80%) out of 15 emergency cases.

This result implies the relationship of emergency situation which was led to tracheostomy with mental status.

That is to say, as the mental state changes alert to drowsy or stuporous, rises the possibility of tracheostomy performance.

Among the medical departments, neurosurgery was related most frequently in the tracheostomy cases in oral and maxillofacial surgery.

This probably shows that as far as related departments are concerned, the possibility of tracheostomy performance rises if neurosurgical problems are combined. The first resident performed most of cases.

This should be inspected in view of the quality of doctor and further studies may be needed whether the quality of first resident is suffice to perform the tracheostomy or not.

Arterial blood gas analysis is a useful test to evaluate airway patency status. There is a report that tracheostomy should performed if  $PCO_2$  is above 70 mmHg in arterial blood<sup>7)</sup>.

Even though ABGA is very useful test to evaluate airway patency status, it was performed merely in 10 cases (59%) out of 17 trauma cases.

Moreover,  $PCO_2$  results in 10 cases were all below 70 mmHg (22 mmHg~41.3 mmHg). So, most of tracheostomy were performed judging from clinical manifestations not from laboratory findings

Decannulation was done on 6-8 th post operation day in most of cases. In trauma cases average decannulation day was 13 th post operation day and in other disease groups average decannulation day was 8 th post operation day.

Most of cases (5 cases, 71%) out of 7 trauma cases of which decannulation day exceeded 9 th post operation day (average decannulation day of other disease groups) showed that the mental state prior to tracheostomy was not alert. This may imply that the longer duration of cannulation in trauma cases may due to mental state which is not alert. 11 case (36%) showed complications, while 4.5% - 12.5% in medical reports. 3 cases (9%) expired, while 0.03 - 0.8% in medical reports<sup>5,6,8,9)</sup>.

Among the complications subcutaneous emphysema (2 cases), aspiration (2 cases), obstruction (1 case), and cannula dislodgement (1 case) were occurred within 3 days. That is to say, oral surgeons have to be careful for their prevention especially within 3 days because the incidence of early complications (54.5%) is relatively high.

## V. Summary

We reviewed medical records of 31 patients who underwent tracheostomy from January, 1986 to July, 1990 at the Department of Oral & Maxillofacial Surgery, Chungnam National University Hospital.

- 1) The most frequent causative disease group for the tracheostomy was maxillofacial trauma, 17 cases (55%).
- 2) Sex ratio between male and female was 15:1 showing 29 cases (94%) in male and 2 cases (6%) in female.
- 3) Tracheostomy was performed most frequently in 21-30 year age group showing 9 cases (28%).



- 4) 19 case(61%) had previous intubation or tracheostomy history.
- 5) Drowsy mental state was showed in 6 cases(40%), stuporous mental state was showed in 6 cases(40%) and alert mental state was showed in 3 cases(20%) prior tracheostomy among the emergency cases.
- 6) Among the medical departments, neurosurgery dept. was the most frequently related dept. in our tracheostomy patients with 11 case(41%).
- 7) Tracheostomy was performed most frequently by first resident with 28 cases(90%).
- 8) 12 cases(71%) showed definite diagnosis by X-ray taking prior to tracheostomy, while 5 cases(29%) had taken tracheostomy without definite diagnosis by X-ray taking.
- 9) All cases(100%) were performed by vertical skin incision method.
- 10) Arterial blood gas analysis(ABGA) was performed in 10 cases(59%) prior to tracheostomy, while ABGA was not performed in 7 cases(41%) prior to tracheostomy in maxillofacial trauma patients.
- 11) 17 cases(55%) were performed under local anesthesia, while 14 cases(47%) were performed under general anesthesia.
- 12) 16 cases(52%) were considered elective, while 15 cases(48%) were considered emergency.
- 13) Tracheostomy was performed most frequently in operation room with 15 cases(48%).
- 14) 22 cases(71%) were cared in ICU, while 9 cases(29%) were not cared in ICU after tracheostomy.

- 15) Decannulation was done most frequently on 6-8th post operation day with 8 cases(24%).
- 16) 8 groups of complications emerged in 11 cases(36%).

Among them early and late complications were 6 cases and 5 cases, respectively.

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## 구강외과 영역에 있어서의 기관절제술 31례에 대한 임상적 고찰

충남대학교병원 구강·악안면 외과학교실  
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기관절제술은 기도확보를 위해 다양한 임상적 상황에서 행해지는 술식으로 1546년에 Brasabola에 의해 처음 성공적으로 시행되었다. 기관절제술의 적응증으로는 상기도 폐쇄의 완화, pulmonary toilet의 촉진, dead space의 감소 및 mechanical ventilation의 장기 사용시 등을 들 수 있겠다. 그동안 term에도 변화가 있었는데, 1718년까지는 “bronchotomy”란 term이 사용되었고 그후 “tracheotomy”란 term이 사용되었으나 1820년 이후에는 “tracheostomy”란 term이 나오게 되어 현재 이 두가지 term이 구별없이 사용되고 있다.

기도폐쇄를 야기시킬 수 있는 악안면 부위의 외상 혹은 여러가지 질병의 증가 추세로인해 구강외과의사가 기관절제술을 시행해야할 상황을빈번히 맞게 된다.

이에, 본 교실에서 기관절제술을 시행한 31명의 환자에 대한 임상적 고찰을 통해 숙련된 기관절제술 및 그 처치능력의 중요성을 보고하는 바이다.