

Anesthetic Experiences with the Very Aged

—An analysis of 16 years period (1966~1981)—

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INTRODUCTION

Anesthesias upon the elderly patient have always been approached with apprehension because of the added hazards posed by age: e.g. chronic debilitating disease.

Recently there are increasing tendency in giving anesthesia for the elderly patient because of the remarkable development in medical fields and the increase in the population of senior citizens.

For the purpose of this paper, we have selected the age of 70 years as the lower limit of the very aged group based on the expectation of life at birth which was 66 years in male and 70 years in female in 1975 according to the census from Ministry of Health and Social Affairs in our country.

For the safe anesthetic practice for the aged, it is essential to learn everything possible about the nature of the advanced geriatric patient and his disease, his reactions to operative stress and anesthetic experiences for the aged.

The purpose of this report is to present anesthetic trends for the very aged, concerning an analysis of 16 years period(1966~1981) about the distributions of age and sex, department, duration of anesthesia, type of anesthesia, type of operation, malignancy, emergency and mortality.

Before starting our presentation, we would like to emphasize three great changes which have

been made the magnificent influences in the number of operations of our hospital since 1979.

They are 1) from 1976, the surgical intensive care unit (SICU) of our hospital was opened, 2) from 1977, the medical insurance was first started in our country and the number of operations have been influenced by it, 3) in 1979, our hospital has been expanded from 550 hospital bed to 1,100 hospital bed.

MATERIAL

The anesthetic records of the patients over 70 years of age from Jan. 1, 1966 through Dec. 31, 1981 and the charts of the SICU from Jan. 1, 1976 through Dec. 31, 1981 were studied.

The data were analyzed according to the yearly distribution by age, sex, department, type of operations, anesthetic used, duration of anesthesia, emergency operation, malignant disease and death.

The plastic surgery included from 1975 and the dental surgery from 1979 because of their opening as a department in our hospital.

The types of operations were arbitrary classified into head & neck, thoracic region, stomach, bowel system, intraabdominal organs, genitourinary system, reproductive organs, extremities & bones and bronchoscopy, and in some times, operations of stomach, bowel system and intraabdominal organs had been included in abdominal disease as a single type in need for compa-

risson with other types.

The duration of anesthesia was also arbitrarily divided into under 1 hour, 1 to 3 hours, 3 to 5 hours and over 5 hours.

The analysis of death included charts since 1976 when the SICU started to open in our hospital.

RESULTS

1. Age and Sex

Total number of operations in over 70 years old during 16 years period were 1,082 cases and the most prevalent age group was the seventieth with 973 cases which were 89.9% the next were eightieth with 105 cases which was 9.7% and the last was ninetieth with only 4 cases which was 0.4%.

Males were 668 cases which were 61.7% and females were 414 cases which were 38.3% and so males were higher than females in the ratio of three to two.

Yearly distribution of male patients was higher than that of female patients except 1970 and 1973.

The reasons that the numbers of the operation were abruptly increased since 1979, would be 1) the introduction of the medical insurance since 1977 in our country and 2) the expansion of our hospital from 550 hospital bed to 1,100 hospital bed since 1979.

The oldest age was 97 years old female gynecologic patient undertaken total abdominal hysterectomy due to myoma of uterus under N₂O-O₂-Halothane-muscle relaxant sequence, and the hospital course was uneventful.

2. Department

The orders of departmental distribution of operation were the 1st. general surgery with 463 operations which were 42.8% of the total operations, the 2nd. urology with 310 operations which were 28.7% of the total operations, the

Table 1. Yearly distribution of age and sex

Year	Sex	Age			Subtotal (%)*	Total (%)**
		70~79	80~89	90		
'66	M	19	1	—	20(74)	27(2.5)
	F	7	0	—	7(26)	
'67	M	18	1	—	19(63)	30(2.8)
	F	11	0	—	11(37)	
'68	M	27	2	—	29(78)	37(3.4)
	F	8	0	—	8(22)	
'69	M	35	3	—	38(70)	54(5.0)
	F	14	2	—	16(30)	
'70	M	10	6	—	16(38)	42(3.9)
	F	24	2	—	26(62)	
'71	M	17	2	—	19(63)	30(2.8)
	F	11	0	—	11(37)	
'72	M	22	3	—	25(53)	47(4.3)
	F	19	3	—	22(47)	
'73	M	15	2	—	17(49)	35(3.2)
	F	16	2	—	18(51)	
'74	M	28	6	—	34(58)	59(5.5)
	F	20	5	—	25(42)	
'75	M	61	8	—	69(75)	92(8.5)
	F	23	0	—	23(25)	
'76	M	45	5	1	51(64)	80(7.4)
	F	23	6	—	29(36)	
'77	M	38	0	—	38(68)	56(5.2)
	F	15	3	—	18(32)	
'78	M	29	7	—	36(66)	55(5.1)
	F	19	0	—	19(34)	
'79	M	61	6	—	67(61)	109(10.1)
	F	38	3	1	42(39)	
'80	M	80	7	—	87(61)	143(14.2)
	F	50	6	—	56(39)	
'81	M	96	5	2	103(55)	186(17.2)
	F	74	9	—	83(45)	
Sub-total (***)	M	601 (55.5)	64 (5.9)	3 (0.3)	668(61.7)	
	F	372 (34.4)	41 (3.8)	1 (0.1)	414(38.3)	
Total (%)**		973 (89.8)	105 (9.7)	4 (0.4)		1,082

*: Percentage over the total number of each year

** : Percentage over total operations (1,082)

***: Percentage over the total number of each age group

3rd. orthopedic surgery with 155 operations which were 14.3% of the total operations and so on.

The ratio of the geriatric operations to the operations of each year was in the range of 0.9% to 1.9% (mean 1.3%) and the highest ratio was in 1972 and the reason of the increase in the geriatric operations since 1979, was not by the selective increase in the geriatric patients but by the increase in the total oper-

Table 2. Yearly distribution of operation by department

Dept.	Year	'66	'67	'68	'69	'70	'71	'72	'73	'74
General		14	13	16	23	17	12	19	15	24
Urologic		7	10	14	14	5	8	13	12	22
Gynecologic		1	1	2	2	5	1	3	—	5
Orthopedic		4	5	3	7	13	6	8	4	6
Thoracic		—	1	—	—	—	—	—	1	1
Neurosurgic		1	—	—	1	—	1	1	—	1
Otolaryngologic		—	—	2	6	2	—	3	2	—
Ophthalmologic		—	—	—	1	—	2	—	1	—
Plastic		—	—	—	—	—	—	—	—	—
Dental		—	—	—	—	—	—	—	—	—
Total(%)**		27(1.1)	30(1.1)	37(1.2)	54(1.6)	42(1.3)	30(0.9)	47(1.9)	35(1.0)	59(1.4)
Grand total		2,549	2,753	3,104	3,296	3,360	3,342	2,537	3,610	4,207

Dept.	Year	'75	'76	'77	'78	'79	'80	'81	Total(%)*
General		35	34	28	19	62	58	74	463(42.8)
Urologic		28	29	14	20	21	45	48	310(28.7)
Gynecologic		2	2	2	—	8	4	9	47(4.3)
Orthopedic		9	9	5	7	10	22	37	155(14.3)
Thoracic		3	—	1	—	3	4	7	21(1.9)
Neurosurgic		1	—	—	—	2	3	2	13(1.2)
Otolaryngologic		12	5	6	3	—	2	—	43(4.0)
Ophthalmologic		2	1	—	6	2	—	2	14(1.3)
Plastic		2	1	—	—	—	2	—	5(0.5)
Dental		—	—	—	—	1	3	7	11(1.0)
Total(%)**		92 (1.7)	80 (1.5)	56 (1.0)	55 (1.0)	109 (1.2)	143 (1.2)	186 (1.4)	1,082 (1.3)***
Grand total		5,356	5,379	5,761	5,742	9,178	12,344	13,344	85,842

*: Percentage over total geriatric operations (1,082)

** : Percentage over grand total operations of each year

***: Percentage over grand total operations (85,842)

ations of each year.

The reason of the absence of the operations in the plastic surgery before 1975 and in the dental surgery before 1979 was due to the absence of those departments at that time.

3. Type of operations

The operations of abdominal region were the most frequent types with 410 cases which were 37.9% of the total operations. Among the type of operations, stomach was the most frequent

type as a single organ with 129 cases which were 11.9%. The order of the frequencies in the type of operations besides the abdominal region were the genitourinary system with 305 operations which were 28.2%, the extremities and bones with 168 operations which were 15.5%, and so on.

4. Type of anesthesia

The anesthetics used were diethyl-ether, N₂O-diethyl-ether, N₂O with or without intrav-

Table 3. Yearly distribution of type of operations

Type of Op.	Year	'66	'67	'68	'69	'70	'71	'72	'73	'74
Head & Neck		1	—	2	2	2	2	3	2	—
Thoracic region		—	—	1	4	—	—	—	3	3
Stomach		4	3	3	3	5	3	6	2	5
Bowel system		6	9	9	14	9	7	8	7	12
Intraabdominal organs		3	1	3	2	2	3	6	2	5
Genitourinary system		7	10	14	14	5	6	13	12	22
Reproductive organs		1	1	2	2	5	1	3	—	5
Extremities & Bones		5	6	3	7	12	8	6	6	7
Bronchoscopy		—	—	—	6	2	—	2	1	—
Total		27	30	37	54	42	30	47	35	59

Type of Op.	Year	'75	'76	'77	'78	'79	'80	'81	Total(%)
Head & Neck		5	4	9	9	2	5	17	65(6.0)
Thoracic region		11	—	1	1	9	12	15	60(5.5)
Stomach		10	12	5	4	25	20	19	129(11.9)
Bowel system		15	8	13	5	16	17	23	178(16.5)
Intraabdominal organs		6	10	4	7	17	16	16	103(9.5)
Genitourinary system		27	27	14	20	21	44	49	305(28.2)
Reproductive organs		2	2	3	—	8	4	9	48(4.4)
Extremities & Bones		7	12	6	9	11	25	38	168(15.5)
Bronchoscopy		9	5	1	—	—	—	—	26(2.4)
Total		92	80	56	55	109	143	186	1,082(100)

() : Percentage over total operations

Table 4. Yearly distribution of type of anesthesia

Anesth.	Year	'66	'67	'68	'69	'70	'71	'72	'73	'74
Ether		2(7.4)	3(10.0)	3(8.1)	3(5.6)	2(4.8)	1(3.3)	2(4.3)	—	—
N ₂ O+Ether		1(3.7)	—	—	—	—	—	1(2.1)	—	—
N ₂ O±IV		9(33.3)	10(33.3)	3(8.1)	2(3.7)	1(2.4)	—	1(2.1)	—	—
N ₂ O+Halothane		2(7.4)	5(16.7)	4(10.8)	13(24.1)	21(50.0)	12(40.0)	20(42.6)	10(28.6)	30(50.8)
N ₂ O+Ethrane		—	—	—	—	—	—	—	—	—
Spinal		12(44.4)	12(40.0)	25(67.6)	34(63.0)	18(42.9)	17(56.7)	23(48.9)	24(68.6)	28(47.6)
Local		1(3.7)	—	2(5.4)	2(3.7)	—	—	—	1(2.9)	1(1.7)
Total		27	30	37	54	42	30	47	35	59

Anesth.	Year	'75	'76	'77	'78	'79	'80	'81	Total(%)*
Ether		—	—	1(1.8)	—	—	—	—	17(1.6)
N ₂ O+Ether		—	—	—	—	—	—	—	2(0.2)
N ₂ O±IV		—	—	—	—	—	—	—	26(2.4)
N ₂ O+Halothane		39(42.4)	45(56.3)	38(67.9)	42(76.4)	86(78.9)	106(74.1)	92(49.5)	561(51.8)
N ₂ O+Ethrane		1(1.1)	—	2(3.6)	1(1.8)	—	—	12(6.5)	16(1.5)
Spinal		45(48.9)	29(36.3)	15(26.8)	7(12.7)	23(21.1)	41(28.7)	82(44.1)	435(40.2)
Local		7(7.6)	6(7.5)	—	5(9.0)	—	—	—	25(2.3)
Total		92	80	56	55	109	143	186	1,082(100)

* : Percentage over total operations

() : Percentage over total number of each year

enous thiopental with or without muscle relaxants, N₂O-Halothane with or without muscle relaxants, spinal and local.

The most frequent type was N₂O-Halothane with or without muscle relaxant with 51.8% of the total operations and the next frequent type was spinal anesthesia with 40.2%.

Diethyl-ether and N₂O with or without intravenous thiopental was discontinued since 1972 except 1 case with diethyl-ether in 1977.

Local anesthesia had been used mainly for bronchoscopy.

The use of N₂O-Halothane with or without muscle relaxant had been increasing in tendency except 1981 when the use of Ethrane and spinal anesthesia was increased. Spinal anesthesia had been decreased except 1981 when its use was abruptly increased.

Ethrane, since introduction in 1975 in our hospital, had been occasionally used until 1978,

Table 5. Yearly distribution of duration of anesthesia

	'66	'67	'68	'69	'70	'71	'72	'73	'74	'75	'76	'77	'78	'79	'80	'81	Total(%)
Under 1 hour	—	—	3	6	6	3	8	5	12	17	13	9	10	9	15	37	153(14.1)
1~3 hours	14	14	21	35	26	21	17	19	35	52	38	29	33	51	85	121	611(56.5)
3~5 hours	11	11	10	11	9	5	20	11	11	13	26	14	6	38	38	23	257(23.8)
Over 5 hours	2	5	3	2	1	1	2	—	1	10	3	4	6	11	5	5	61(5.6)
Total	27	30	37	54	42	30	47	35	59	92	80	56	55	109	143	186	1,082(100)

() : Percentage over total operations

Table 6. Yearly distribution of emergency operations according to department

Dept.	Year	'66	'67	'68	'69	'70	'71	'72	'73	'74	'75
General		—	—	6	8	7	—	2	2	1	9
Urologic		—	—	—	3	—	—	—	—	1	2
Gynecologic		—	—	—	—	1	0	1	—	—	1
Orthopedic		—	—	—	1	3	1	0	1	—	2
Thoracic		—	—	—	—	—	—	—	—	—	1
Neurosurgic		—	—	—	1	—	1	0	—	—	1
Total(%)*		0 (0)	0 (0)	6 (4.1)	13 (8.8)	11 (7.5)	2 (1.4)	3 (2.0)	3 (2.0)	2 (1.4)	16 (10.9)
Dept.	Year	'76	'77	'78	'79	'80	'81	Total	(%)*	(%)**	(%)***
General		8	8	10	15	16	12	104	(70.7)	(22.5)	
Urologic		1	1	—	—	1	—	9	(6.1)	(2.9)	
Gynecologic		1	—	—	1	1	2	8	(5.4)	(17.0)	
Orthopedic		2	2	3	2	1	—	18	(12.2)	(11.6)	
Thoracic		—	1	—	—	1	—	3	(2.0)	(14.3)	
Neurosurgic		—	—	—	1	1	—	5	(3.4)	(38.5)	
Total(%)*		12 (8.2)	12 (8.2)	13 (8.8)	19 (12.9)	21 (14.3)	14 (9.5)	147			(13.6)

*: Percentage over total emergency operations

**: Percentage over total operations of each department

***: Percentage over total operations

Table 7. Yearly distribution of malignant diseases

malignant lesion \ Year	'66	'67	'68	'69	'70	'71	'72	'73	'74
Head & Neck	—	—	—	—	—	—	1	—	—
Thoracic	—	—	1	1	—	—	—	1	2
Stomach	—	2	1	1	1	1	1	—	4
Bowel system	1	2	—	1	1	1	1	2	—
Intraabdominal organs	2	1	—	—	1	—	4	—	—
Genitourinary system	—	2	—	5	5	4	3	5	3
Reproductive organs	—	—	2	—	—	—	2	—	—
Extremities & Bones	2	—	—	2	7	1	1	4	5
Total(%)*	5 (1.3)	7 (1.8)	4 (1.0)	10 (2.5)	15 (3.8)	7 (1.8)	13 (3.3)	12 (3.0)	14 (3.6)

malignant lesion \ Year	'75	'76	'77	'78	'79	'80	'81	Total(%)* (%)***
Head & Neck	—	1	2	—	2	2	6	14(3.6) (21.5)
Thoracic	3	—	1	1	7	4	6	27(6.9) (45.0)
Stomach	4	7	5	3	18	18	15	81(20.6) (62.8)
Bowel system	7	3	6	3	5	5	11	49(12.4) (27.5)
Intraabdominal organs	3	5	3	3	9	3	2	36(9.1) (35.0)
Genitourinary system	6	10	6	7	8	15	12	91(23.1) (29.8)
Reproductive organs	—	2	1	—	3	3	5	18(4.6) (37.5)
Extremities & Bones	4	2	3	5	8	9	25	78(19.8) (46.5)
Total(%)*	27 (6.9)	30 (7.6)	27 (6.9)	22 (5.6)	60 (15.2)	59 (15.0)	82	394(36.4)** (20.8)

*: Percentage over number of malignant diseases.

** : Percentage over total operations(1,082)

***: Percentage over operations of each disease

but in 1981, its use was abruptly increased and the reason for that was the disapproval by the medical insurance association until the end of 1980.

5. Duration of anesthesia

Most operations which occupied over 70% were performed within 3 hours.

There were no particular changes in the duration of anesthesia administration according to years except the slight increase in long operations (over 5 hours) in 1975 and 1979 sporadically.

The longest operation took 10 hours on 73 years old female patient who had undertaken vulvectomy with pelvic excentration due to vaginal cancer under N₂O-O₂-Halothane-Pavulon

sequence on July 22, 1981 and her hospital course was uneventful except transient minimal pneumonic infiltration on right lower lung field on chest x-ray.

6. Emergency operation

The number of emergency operations were 147 cases which were 13.6% of the total geriatric operations.

Among the departments, general surgery was the top with 104 cases which were 70.7% of the total emergency operations and 22.5% of the operations done by general surgery.

The second was orthopedic surgery with 18 cases which were 12.2% of the total emergency operations and 11.6% of the operations done by orthopedic surgery.

The department which had the highest percentage of emergency operations over operations done by each department, was neurosurgery with 38.5%. Annual distribution in the ratio of emergency operations showed in the range of 0% to 14.3%, and 1980 took the top place with 14.3%.

7. Malignant disease

Total number of malignant diseases were 364 cases which were 36.4% of total operations.

Total abdominal malignancies were most frequent with 166 cases which were 42.1% of total malignancies and the order of the remainders were genitourinary, extremities and bones, and so on.

The top rank in the number and in the ratio of malignancies per each organ operations as a single organ was stomach with 20.6% of total malignancies and 62.8% of total stomach operations respectively.

Annual distribution of malignancies was from 1.0% in 1968 to 20.8% in 1981 and malignant diseases were increasing in tendency which was

most distinct from 1979.

8. Death

Total death during 6 years period since 1976 were 14 patients with 8 males and 6 females who were 2.2% of total operations performed during 6 years period and the annual death rates were in the range of 1.1% in 1981 to 3.8% in 1976 versus the operations of each year with decreasing tendency in death rate year by year.

The most frequent diseases of death were perforated appendicitis with 6 of 14, the most frequent causes of death were sepsis with 11 of 14 and all patients took emergency operations which were 15.4% of all emergency operations since 1976.

Anesthesias were 9 general (N₂O-O₂-Halothane-Pavulon) and 5 spinal anesthetics and the longest duration of anesthesia was 4 hours 10 min.

The mortality by general and spinal anesthesia was 2.2% and 2.5% respectively.

Table 8. Distribution of deaths since 1976

	Age	Sex	Name of Disease	Cause of Death	Emergency	Anesthesia	Duration of anesth..
1976	72	M	Perforated Appendicitis	Sepsis	+	NHP	2hrs. 20min.
	75	F	Perforated Appendicitis	Sepsis	+	NHP	2hrs. 30min.
	90	M	Bleeding Urinary Bladder	Heart failure	+	Spinal	3hrs. 20min.
1977	70	M	Perforated Appendicitis	Sepsis	+	Spinal	2hrs. 10min.
	78	F	Gall Bladder Empyema	Sepsis	+	NHP	3hrs. 10min.
1978	75	F	Femur Fracture	Pneumonia	+	Spinal	2hrs. 30min.
	78	M	Perforated Appendicitis	Sepsis	+	NHP	2hrs. 50min.
1979	71	M	Perforated Jejunum	Sepsis	+	NHP	3hrs. 40min.
	73	F	Obstructed Colon Cancer	Sepsis	+	NHP	4hrs. 10min.
	80	M	Perforated Appendicitis	Sepsis	+	Spinal	1hrs. 50min.
1980	75	M	Gall Bladder Empyema	Sepsis	+	NHP	2hrs. 30min.
	78	F	Femur Fracture	Pneumonia	+	Spinal	2hrs. 10min.
1981	78	M	Perforated Appendicitis	Sepsis	+	NHP	1hrs. 50min.
	96	F	Cholecystitis	Sepsis	+	NHP	3hrs. 10min.

N: Nitrous Oxide, H: Halothane, P: Pavulon

DISCUSSION

There has been debating on defining the minimum years for the aged because of the individual difference in physiologic changes by aging differing from chronologic age. (Rankin & Johnston, 1939; Danilevicus 1974)

In present study, 70 years of age is used as minimum years of the very aged based on the life expectancy of our country.

Lorhan(1967) reported females were almost twice in octogenarian operations, but the predominance of males in this study was very similar with Herron et al.(1960) and Lewin et al.(1971).

Memery(1965), Lorhan(1967) and Jegathesan et al.(1971) said that the anesthetic of preference is debatable, but skillful administration of and continuous monitoring during anesthesia are more important than the choice of anesthesia

Gauthier & Hamelberg (1963) reported that by reviewing 200 patients with hip fracture, they were unable to find any significant difference between general and spinal anesthesia.

Ellison (1975) advocated that general anesthesia may be the anesthetic of choice even if pulmonary disease is present because general anesthesia may represent a small amount of analgesia with a large amount of mechanical ventilation, tracheobronchial toilet and circulatory support.

A good anesthetist, a short operative time and careful postoperative care will render the use of general anesthesia in old people as safe as any other anesthetic available (Rankin et al., 1939).

Lewin et al. (1971) reported that there was a direct relationship between the duration of anesthesia and death and short procedures lasting less than 2 hours had no mortality.

By Cogbill(1967), mortality were about the same for operations requiring two hours or less of anesthesia as for those requiring anesthesia of longer duration and the present study agrees with Cogbill.

Herron et al.(1960) and Cogbill(1967) advocated that concurrent acute disease should be vigorously treated and operation deferred until it was controlled and because of the high mortality rate, fewer radical operations should be done in the aged.

Herron et al.(1960) reported that sepsis of all types and cardiovascular disease accounted for the majority of deaths and in some instances differentiation between these two categories was difficult.

Mithoefer & Mithoefer(1954) already declared that no component of difference in the mortality rate between elderly and younger patients seemed dependent upon age per se.

The operative mortality rate in the aged has been variously reported to be from 9 to 40%, but Meyer et al. (1958) had reported no surgical deaths in 66 octogenarian.

There are lack of recent report for mortality rate for the very aged but it must be very low rate because of the magnificent development in medical knowledge and equipments and patient's care compared to previous days. Ziffren (1953) reported that in spite of a more than five fold increase in the number of surgical procedures performed in later year, the mortality rate has dropped from 15.1% to 11.3%.

Gilchrist et al.(1958), dePyester(1961), Stahlgren(1961), Lorhan(1967) and Cogbill (1967) said that the mortality rate after emergency operation was higher than the mortality rate after non-emergency operation.

A careful systemic preanesthetic assessment is very important and a safe anesthesia plan requires a thorough and thoughtful history taking, a careful physical evaluation and a

review of the medical record (Gordon, 1977).

The patient's age is not the important factor governing operative risk, but rather the nature and extent of disease process requiring surgery (Gilchrist et al., 1958).

Elderly people tolerate surgery surprisingly well. Postoperative care must be as meticulous as the preoperative preparation in order to forestall complications whenever possible, but they must be treated promptly and vigorously when they do occur (Rankin et al., 1939, Ziffren, 1953).

In agreement with Herron et al. (1960), Stahlgren (1961) and Ellison (1975), measures which decrease the mortality rate, are as follows:

1. Adequate preoperative preparation and planned elective operation
2. Expert anesthesia
3. Choice of adequate, earliest, shortest traumatic operation
4. Intensive post-operative care

SUMMARY

From the analysis of operations of the aged (over 70 years of age) during 16 years period from 1966 through 1981, the followings were obtained:

1. Total operations were 1,082 with 668 males (61.7%) and 414 females (38.3%).
2. General surgery took the most frequent operations.
3. Abdominal surgery was most predominant and stomach was the most frequent lesion as a single organ.
4. N₂O-O₂-Halothane with or without muscle relaxant had been the most frequent type of anesthetic, and spinal anesthesia was increased abruptly in 1981, and there was no clear relationship between the type of anesthetic and death.

5. Over 70% of operations were carried within 3 hours and there was no clear relationship between the duration of anesthesia and death.

6. Emergency operations occupied 13.6% of total operations and all deaths occurred within the emergencies with 15.4% of total emergencies.

7. Malignancies were 36.4% of total operations and stomach cancer was most frequent in number and the ratio per each organ operations.

8. The most frequent cause of death was sepsis and the most frequent diseases was perforated appendicitis.

==국문초록==

노인 마취의 경험

16년간의 분석(1966~1981)

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노인에 대한 안전한 마취를 시행하기 위하여는 연령 증가에 기인한 특성과 질환 및 수술 침습에 대한 반응 및 노인환자 마취경험등 가능한 모든 점을 이해하고 익혀야 한다.

본 연구의 목적은 1966년부터 1981년 사이의 16년간의 70세이상 노인 수술환자를 대상으로 연령별, 성별, 과별, 마취시간별, 마취종류별, 수술종류별, 악성종양별, 응급수술별 및 사망별로 분석을 함으로써 노인마취에 대한 경향을 정립하고자 한다.

1966년부터 1981년 사이의 16년간의 노인수술환자를 분석하여 아래와 같은 결론을 얻었다.

1. 총 수술건수는 1,082예였고 남자는 668예(61.7%) 여자는 414예(38.3%)로 남자가 많았다.
2. 일반외과 수술이 가장 많았다.
3. 복부수술이 가장 많았으며 단독 기관으로서서는 위수술이 가장 많았다.
4. 소기+산소+halothane+근육이완제 마취법이 가장 많았고 1981년에 척추마취가 갑자기 증가하였으며 마취방법과 사망을 간에는 유의한 관계가 없었다.
5. 70%이상의 수술이 3시간 이내에 시행되었으며 마취시간과 사망을 간에는 유의한 관계가 없었다.

6. 응급수술은 전체수술의 13.6%였고, 사망자는 모두 응급수술에였으며 사망자는 총 응급수술의 15.4%를 차지하였다.

7. 악성종양은 36.4%를 차지하였고 위암이 가장 많았다.

8. 사망원인으로는 패혈증(sepsis)이 가장 많았으며 사망질환중 가장 많은 질환은 충수돌기 천공(perforated appendicitis)이었다.

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