Comparison of Immediate Recovery Period Among Young, Middle-aged and Elderly Patients

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Abstract

We reported the immediate recovery period of 705 consecutive patients post general or head-neck-breast surgery, 590 were looked after in the recovery room (RR) and 115 were admitted into the intensive care unit (ICU) right after surgery. Group I were "young" (aged 15-45 years), group II were "middle aged" (46-60 years) and group III were "elderly" (>60 years). Twenty-seven per cent of the elderly patients were sent to the ICU, whereas, 8.4 per cent of the young and 14.7 of the middle-aged group were looked after in the ICU. In RR patients, the young group were in better ASA class and had significantly fewer underlying diseases than the middle-aged and elderly groups; the most common of which were hypertension, diabetes and anemia. Elderly patients spent a significantly longer time in the RR than the young group but the risk of complication was not different. The most frequent complication was pain and elderly patients more frequently suffered from pain than the young group. Post-anesthetic recovery score (after Aldrete and Kroulik) was lower in the elderly on arrival and at 15, 30, 60 minutes in the RR but there was no clinical significance. In ICU patients, the 3 groups' intubation rates were not different and although the duration of intermittent positive pressure ventilation and duration of stay in the ICU were longest in the elderly group, there was no statistically significant difference. The mortality rate was highest in the elderly. We concluded that elderly patients had a worse immediate recovery period.

Elderly patients are increasing in number and more of them are scheduled to have surgery and anesthesia than in the past. We in the Department of Anesthesia, Siriraj Hospital anesthetize at least seventeen thousand patients a year, nine per cent of them (about sixteen hundred patients) were more than 60 years old. We believe that elderly patients are more fragile and may have a higher

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risk of developing complications in the immediate post-operative period.

Objectives

We want to compare the immediate recovery period among young, middle-aged and elderly patients in the following aspects :-

Patients in the recovery room (RR)
- recovery room time
- post-operative complications
- post-anesthetic recovery score

Patients in the intensive care unit (ICU)
- need of endotracheal intubation and ventilatory support
- duration of stay and mortality

MATERIAL AND METHOD

During office hours of 134 days, in 1995 the authors did a prospective observation of 590 consecutive patients in the recovery-room after general and head-neck-breast surgery at Siriraj Hospital. One trained RR head-nurse was the evaluator of all patients. She recorded the age, ASA class, underlying diseases, choice of anesthesia, site of surgery, recovery score, recovery-room time and complications by filling in a planned protocol.

The post-anesthetic recovery score was taken after a study by Aldrete and Kroulik[1]. This scoring system is quite similar to the Apgar score, five clinical signs are evaluated (Appendix) : the colour of the patient, the consciousness, the change in blood pressure, respiratory pattern and movement of his extremities. Each of these was scored zero, one or two; the lower score represented problems in recovering from anesthesia. The maximum (best) score was ten.

The patients who were sent from the same lists to the intensive care unit (ICU) during the same period of time were retrospectively studied. The decision on where the patients would go to belonged to the anesthesiologists who anesthetized them. We found that 115 patients were sent to the ICU right after surgery. In this group of patients, we recorded age, site of surgery, pre-operative underlying diseases, post-operative respiratory status in the ICU and their mortality rate.

All patients were divided into 3 age groups :

Group I aged 15-45 years were "young".
Group II aged 46-60 years were "middle-aged".
Group III aged > 60 years were "elderly".

Analysis was done by one-way ANOVA and Chi-square test. Statistical comparison was done only among groups that had enough patients.

RESULTS

Seven hundred and five patients were anesthetized during the period of study. There were 239, 259, and 207 patients in group I, II, III respectively. The percentage of each age group who were sent to the RR and those who were sent to the ICU is shown in Table 1. More than one in four elderly patients went to the ICU whereas less that 10 per cent of the young group and about fifteen per cent of the middle-aged group were cared for in the ICU.

The number of preoperative underlying diseases is shown in Table 2. In RR patients, the young group had significantly fewer underlying diseases than the middle-aged and elderly groups. Similarly, 21.3 per cent and 29.4 per cent of elderly patients in the ICU and RR respectively had more than one underlying disease, whereas 1.8 per cent and 20 per cent of young patients in the RR and ICU had more than one underlying disease.

Table 3 shows the underlying diseases of RR patients in detail. The three most common underlying diseases were hypertension, diabetes and anemia. Significantly fewer young patients had underlying cardiovascular disease than their

Table 1. Number (and per cent) of patients sent to recovery room and intensive care unit.

Group	Young		Middle-aged		Elderly		Total	
	No.	%	No.	%	No.	%	No.	%
Recovery room	219	91.6	221	85.3	150	72.5	590	83.7
Intensive care unit	20	8.4	38	14.7	57	27.5	115	16.3
Total	239	33.9	259	36.7	207	29.4	705	100.0

Table 2. Number (and per cent) of patients with pre-operative underlying diseases.

Number of disease	Young(I)		Middle-aged (II)		Elderly (III)		p Value
	No.	%	No.	%	No.	%	
Recovery room							
0	185	84.5	131	59.3	69	46.0	$<10^{-6}$ (I/II/III)
1	30	13.7	63	28.5	49	32.7	0.05 (I/II,I/III)
>=2	4	1.8	27	12.2	32	21.3	
Number of patients	219		221		150		
Intensive care unit							
0	8	40.0	16	42.1	16	31.4	
1	8	40.0	17	44.7	20	39.2	
>=2	4	20.0	5	13.2	15	29.4	
Number of patients	20		38		51		

Table 3. Percentage of recovery room patients in each group who had underlying diseases.

Systems involved by diseases	Patients (N=590) %	Young (I)	Middle-aged (II)	Elderly (III)	p Value
Cardiovascular	114	1.8	24.9	36.7	10-6 (I/II,I/III)
Endocrine	53	4.6	10.9	12.7	0.013 (I/III)
Hematological	38	5.9	4.1	10.7	0.037 (II/III)
Gastrointestinal	22	1.8	4.1	0.6	0.109
Respiratory	21	1.4	4.5	5.3	0.081
Fluid, electrolyte	6	0	1.4	2.0	
Central nervous	6	0	1.8	1.3	
Urinary	4	0	1.8	0	
Skeletal	2	0	0.5	0.7	
Miscellaneous	9	2.3	2.7	5.3	0.23

older counterparts. Elderly patients had a higher prevalence of endocrine (diabetes mellitus) and hematological diseases (anemia) than the young and the middle-aged respectively. ASA classes of recovery-room patients are shown in Table 4. Every group was significantly different from the other, i.e., the older the patients, the higher the chance of having systemic diseases that affect their activities.

In the recovery-room group, significantly fewer young patients underwent upper abdominal operations than older patients as shown in Table 5. Regarding the ICU, most of the patients in all age groups had upper abdominal surgery. In those who had lower abdominal surgery, none of the young and middle-aged had to be looked after in the ICU, whereas 6 patients (10.5 per cent) of the elderly did. General anesthesia was the anesthetic technique given in about 70 per cent of patients who went to the RR and 100 per cent of patients sent to the ICU, with no difference among age groups.

Post-anesthetic recovery scores, Table 6, were lower in the elderly on arrival in the recovery room, also at 15,30 and 60 minutes in the recovery room. However, there was no clinical significance and 2 patients who had to be sent from the RR to the ICU had a score of 8, 9 respectively.

The duration of stay in the recovery room is shown in Table 7. Elderly patients spent a significantly longer time in the recovery room than the young group. Post-operative complications found in the recovery room are shown in Table 8. The chance that the patients had no complications were not different among the three groups. Pain was the most frequent complication and elderly patients suffered more frequently from pain than

Table 4. Number (and per cent) of recovery-room patients according to the American Society of Anesthesiologists classification.

ASA class (N=590)	Young (n=219)	%	Middle-aged (n=221)	%	Elderly (n=150)	%	p Value
1	187	85.4	121	54.8	29	19.3	<0.0001 (I/II/III)
2	31	14.2	92	41.6	106	70.7	
3	1	0.4	8	3.6	15	10.0	

Table 5. Sites of surgery and general anesthesia shown in per cent of patients in the three age groups.

	Recovery room			Intensive care unit		
	I n=219	II n=221	III n=150	I n=20	II n=38	III n=57
Upper abdominal	21.0	37.1	50.0	80.0	94.7	78.9
Lower abdominal	42.9	36.7	30.7	0	0	10.5
Extremities	3.7	4.5	4.0	10.0	2.6	8.8
Head-neck-breast	32.4	21.7	15.3	10.0	2.6	1.8
General anesth.	68.9	74.2	72.6	100.0	100.0	100.0

Table 6. Post-anesthetic recovery score*.

Time (minute)	Young	Middle-aged	Elderly
0	9.34	9.22	9.02
15	9.54	9.35	9.33
30	9.76	9.67	9.62
60	9.84	9.79	9.72

* Aldrete JA, Kroulik D, Anesth Analg 1970.

Table 7. Percentage of patients and recovery room time (n=590).

Recovery room time (minute)	Young	Middle-aged	Elderly	p Value
<=60	42.9	38.0	26.7	0.0008 (I/III)
>60-90	43.4	41.2	42.7	
>90-120	10.5	16.3	19.3	
>120	3.2	4.5	11.3	

the young group. The rate of shivering was not different, whereas, nausea and vomiting were found more often in the young and middle-aged groups. Among 590 patients, two (one young and one middle-aged) could not be sent to the ward but had to be transferred to the ICU.

In patients who were sent to the ICU, Table 9, the percentage of patients who went with endotracheal tubes were not different among the three age groups. The duration of intermittent positive pressure ventilation and duration of stay in the ICU were longest in the elderly group, but there was no statistically significant difference. The mortality rate was highest in the elderly which was significantly higher than the middle-aged group. Although the difference between the mortality rates in the elderly and the young was not statistically significant, the figures (14% and 5.2%) should be considered clinically significant.

DISCUSSION

Siriraj Hospital is a tertiary-care, general hospital. Despite the large capacity (2,400 beds), it has a high bed-occupancy rate and is a referral center for hospitals around the country. Thirty per cent of the surgical patients in this study were elderly. This ratio may be higher than that of elderly patients in all admissions because we studied patients in the general surgery and head-neck-breast surgery lists.

Table 8. Per cent of patients and post-operative complication in the recovery room (N=590).

Complication	Young	Middle-aged	Elderly	p Value
None	50.2	44.3	42.0	0.25
Pain	25.6	35.7	40.7	0.0062 (I/III)
Shivering	17.4	14.5	17.3	0.66
Nausea and vomiting	14.6	11.8	0	<0.0001 (I,II/III)
Respiratory	1.4	3.6	2.7	
Cardiovascular	0.5	2.7	0.7	
Needed ICU	0.5	0.5	0	

Table 9. Intubation, ventilatory support (IPPV), duration of stay and mortality rate of patients in the ICU (n=115).

	Young I	Middle-aged II	Elderly III	p Value
On endotracheal tube (per cent)	68.4	75.0	65.4	0.63
Days of IPPV	3.75±5.82	1.65±1.67	5.13±7.54	
(mean±SD, range)	1-18	1-9	1-30	
Days in ICU	3.80±4.43	2.76±1.55	5.19±6.58	0.07
(mean±SD, range)	1-18	1-9	1-31	
Mortality (per cent)	5.2	2.6	14.0	0.04 (II/III)

Twenty-seven per cent of elderly patients were looked after in the ICU. These included both planned and unplanned ICU admissions. Because of the limited number of ICU beds, some requests would have been turned down so the percentage here was the lower limit but it represents the real clinical practice. The space needed will only be increased in the future because of increased percentage of the elderly in the population. This means that personnel and equipment in the ICU will have to be expanded.

Underlying diseases were significantly less common in the young than the middle-aged and the elderly and this was the result of fewer cardiovascular patients. The ASA classification, looking at physical status, also showed elderly patients to be worse physiological, riskier classes. These explained the decision making of anesthesiologists that resulting in more elderly patients in the ICU. Even in the RR group, more than 1 in 3 elderly had cardiovascular diseases. By "resting" criteria (history of angina pectoris or documented myocardial infarction or abnormal resting 12-lead electrocardiogram), the prevalence of suspected coronary artery disease is estimated to increase from 10 per cent at ages 51-60 to 20 per cent at ages 71-90. But by thallium 201-aided stress test, it was found that the prevalence of coronary artery disease increased to 25 per cent at ages 51-60 and 55 per cent at ages 71-90[2]. Age more than 70 years was one of the preoperative factors relating to the development of postoperative life-threatening or fatal cardiac complications[3].

The site of surgery was another factor that had influence upon the decision where the patients should be looked after. Anesthesiologists want to assure adequate ventilation and oxygenation while providing pain relief, and some prefer not to reverse the muscle relaxants but continue to ventilate the patients postoperatively. This explained why general anesthesia was the anesthetic technique of all patients who had to go to the ICU. Not that general anesthesia resulted in ICU admission but because upper abdominal surgeries were usually done under general anesthesia.

Glomerular filtration rate declined linearly beginning at age 40 and any substance whose excretion is dependent in part upon filtration is affected by aging[4]. This is another important

consideration in management, i.e., anesthesiologists usually lower the dose of drugs used in the elderly. We tend to use more short-acting drugs and more monitoring, but the study still showed a higher percentage of elderly patients in the ICU.

The conventional order in the RR was to observe cardiorespiratory signs for about 1 hour. We found that the recovery room score by Aldrete and Kroulik[1] was easy enough for our nursing staff to follow, despite the lack of personnel. The evaluation technique is non-invasive and the authors recommended that a score below 8 should warn of danger. However, we found that this scoring system is not sensitive enough to discriminate between "perfect" recovery and "not so perfect" recovery since each item will score less than full only when there has been significant deterioration. Certainly there is a trade off that clinicians have to judge in order to choose a scoring system; a more complex one, e.g., APACHE[5] has a higher predictive value but is more invasive and time consuming. Aldrete and Kroulik's original score is also not useful in predicting time spent in the RR ; although the recovery room scores were similar, elderly patients spent more time in the RR and had more severe pain than the young group. Delayed recovery in the elderly can be explained by the pharmacokinetics and pharmacodynamics of drugs[6], aging process of the brain and reduced capacity for homeostatic regulation[7]. However, Aldrete recently replaced color with oxygen saturation as a more precise means of measuring adequate blood oxygenation[8].

In this study, 2 out of 590 patients in the RR had to be sent to the ICU, i.e., 0.34 per cent needed the ICU but had been wrongly planned. We could not explicitly calculate how many patients did not need the ICU but were accepted in because the criteria of admission were not objective and the number of beds available varied from day to day. Since the booking of ICU beds is on the first come, first serve basis and patients with different operative procedures compete for the limited beds, explicit criteria and a more communicative channel should enable more appropriate allocation.

In the ICU, about 70 per cent of all age groups were ventilated *via* endotracheal tubes. The duration of ventilatory support and ICU stay, longer in the elderly patients, meant a higher cost and a need of more ICU personnel.

Appendix : Post-anesthetic recovery score

Activity	Able to move 4 extremities voluntarily or on command	= 2
	Able to move 2 extremities voluntarily or on command	= 1
	Able to move 0 extremities voluntarily or on command	= 0
Respiration	Able to deep breathe and cough freely	= 2
	Dyspnea or limited breathing	= 1
	Apneic	= 0
Circulation	BP $\pm$ 20 % of preanesthetic level	= 2
	BP $\pm$ 20 -50 % of preanesthetic level	= 1
	BP $\pm$ 50 % of preanesthetic level	= 0
Consciousness	Fully awake	= 2
	Arousable on calling	= 1
	Not responding	= 0
Color	Pink	= 2
	Pale, dusky, blotchy, jaundiced, other	= 1
	Cyanotic	= 0

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การเปรียบเทียบการฟื้นจากการระงับความรู้สึกระหว่างผู้ป่วยหนุ่มสาว, กลางคน และสูงอายุ

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รายงานการฟื้นจากการระงับความรู้สึกในผู้ป่วย 705 รายหลังการผ่าตัดช่องท้อง ศีรษะคอและเต้านม. 590 รายได้รับการดูแลในห้องพักฟื้นในขณะที่ 115 ราย ได้รับการดูแลในหออภิบาล. กลุ่ม 1 คือผู้ป่วยหนุ่มสาว (อายุ 15–45 ปี), กลุ่ม 2 คือกลางคน (46–60 ปี), และกลุ่ม 3 คือสูงอายุ (>60 ปี). ผู้ป่วยสูงอายุร้อยละ 27 ถูกส่งไปหออภิบาลในขณะที่ผู้ป่วยหนุ่มสาวและกลางคนร้อยละ 8.4 และ 14.7 ตามลำดับถูกส่งไปหออภิบาล. ในกลุ่มที่ไปห้องพักฟื้น พบว่ากลุ่มหนุ่มสาวมีสภาพร่างกายดีกว่าและมีโรคประจำตัวน้อยกว่ากลุ่มอายุสูงกว่าซึ่งมีโรคที่พบบ่อยคือ ความดันโลหิตสูง, เบาหวาน และเลือดจาง. ผู้ป่วยสูงอายุต้องการการดูแลในห้องพักฟื้นนานกว่ากลุ่มหนุ่มสาวแต่มีอาการแทรกซ้อนไม่ต่างกัน ที่พบบ่อยที่สุดคือความเจ็บปวดซึ่งผู้ป่วยสูงอายุมีความเจ็บปวดบ่อยกว่าผู้ป่วยหนุ่มสาว. คะแนนการฟื้นจากการระงับความรู้สึก (ตาม Aldrete และ Kroulik) ในกลุ่มสูงอายุต่ำกว่าทั้งแรกเข้า, 15, 30, 60 นาที ในห้องพักฟื้น แต่ไม่มีนัยสำคัญทางคลินิก. ในกลุ่มที่ไปหออภิบาลมีผู้ป่วยที่ใส่ท่อหายใจอยู่ไม่ต่างกันระหว่างกลุ่ม, ระยะเวลาที่ใส่เครื่องช่วยหายใจและระยะเวลาที่อยู่ในหออภิบาลไม่ต่างกันอย่างมีนัยสำคัญ แต่อัตราตายสูงที่สุดในกลุ่มสูงอายุ. ผู้วิจัยสรุปว่าผู้ป่วยสูงอายุมีการฟื้นจากการระงับความรู้สึกไม่ดีเท่าวัยน้อยกว่า

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