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原　著

Medical Guidance and Care of Masters Swimming:Video Analysis of Two Cases of Drowning Accidents at World Masters' Meets

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ABSTRACT

We analyzed video tapes of the drowning accidents that CPR was provided and we discussed points in common between these two incidents. The photos of the accident as it occurred, taken from the video tapes, provide valuable insight as to why even experienced swimmers can drown. In two cases, we can rule out an equlibrium disturbance as a direct cause for a drowning of an expert swimmers because no evidence of dizziness was seen in progress. Because of the tenseness of a competitive event, master swimmers tend to hyperventilate prior to their match. Further, since older swimmers are less able to endure prolonged periods without oxygen, it is considered that they are more prone to lose consciousness and succumb to No-panic syndrome. Video analysis also show that even skilled lifeguards face difficulties in passing the man over the rope of the lane and in lifting a drowning person from a pool.

Key words; drowning, No-panic syndrome, masters' swimming

Introduction

In Japan, swimming has become popular among the aged, since it can be enjoyed year round. According to the mortality statistics of fiscal year 1994, issued by the Ministry of Health and Welfare, 3,868 people died from drowning[1]. Comparing these statistics with the international mortality rates of deaths from drowning by age, the Japanese mortality rates of children under 4 and adults over sixty-five are the highest. Many drowning accidents of children occnr in bathtub at home, which may be related to the traditional Japanese custom of tub bathing, while the Japanese high mortality rates of adults over sixty-five may be related to the spread of masters swimming. I would like to discuss drowning accidents of swimmers at masters' meets with reference to why even experienced swimmers can drown and how to save swimmers from drowning due to some unexpected occurrence.

Two Cases of the Drowning of Experienced Masters Swimmers.

Case 1: 76y, Male The First World Masters Meet (1986, Japan)

He became unconscious around 130m of 200m breast stroke and sank. cardiopulmonary resuscitation (CPR) was carried out at pool side because of respiratory and cardiac arrests. He discharged after one week. He was a representative

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swimmer at his junior high school.

The photos in this report were taken from the video tapes in Case 1.

Case 2: 81y, Male The Second World Masters Meet (1988, Australia)

At 200m individual medley, after 50m butterfly and 25m backstroke, he became unconscious and sank. CPR was carried out at pool side because of respiratory and cardiac arrests. He discharged after one week of ICU. He got a gold medal at 50m backstroke in the day before accident.

Discussion

1. Current hypotheses of the Drowning of Experienced Masters Swimmers

The cause of the drowning of experienced swimmers is imperfectly understood. It has been reported that experienced swimmers drown due to the mechanism such as ①equilibrium disturbance [2], ② No-panic syndrome[3], ③ endotracheal aspiration of water[4], ④ intoxication by alcohol[5], ⑤ sudden shock by cold water, ⑥ cramps, and ⑦ fear. In these hypotheses, we mention about equilibrium disturbance hypothesis and no-panic syndrome, which are now in the spotlight for the cause of the drowning of an experienced swimmer.

1) The equilibrium disturbance hypothesis

The equilibrium disturbance hypothesis, held by some medico legal experts, is based on the fact that anatomical studies of victims who have died from drowning often show evidence of cone bleeding[2]. It has been hypothesized that water somehow gets into the auditory tubes, thereby blocking them. Thus, the pressure in the auditory tubes changes, causing cone bleeding and damage to the semicircular canal. As a consequence, the equilibrium is disturbed and the swimmer become dizzy and faint. This causes them to drown.

2) No-panic syndrome

No-panic syndrome which describes the sudden loss of consciousness without signs of panic could occur if a swimmer has hyperventilated before plunging into a pool and reminds underwater for a long time[3]. Under normal circumstances, meaning that no hyperventilation has occurred before plunging into the water, a swimmer who remains submerged for a prolonged period begins to feel a choking sensation because of carbon dioxide build-up from non-breathing. Therefore, since hyperventilation lowers the carbondioxide concentration in the blood, swimmers who have hyperventilated before plunging into the water feel little or no choking sensation from carbon dioxide build-up while submerged, and thus could lose consciousness due to a lack of oxygen.

2. Cause of Drowning Accidents Occurred at Masters' Meets:Video Analysis of Two Cases

We analyzed video tapes of the accidents that CPR was provided and we shall discuss points in common between these two incidents. Photo.1 and Photo.2, taken from the video tapes in Case 1, provide valuable insight as to why even experienced swimmers can drown.

In the first scene (Photo.1), the swimmer did not try to breathe but still moved his limbs slowly. It should be mentioned that master swimmers on the verge of drowning are unable to properly swim, even though they move their limbs vigorously. In the next scene (Photo.2), he stopped moving and began to drown without a struggle and the swimmer starts to sink. It should be pointed out that he did not show any evidence of breathing

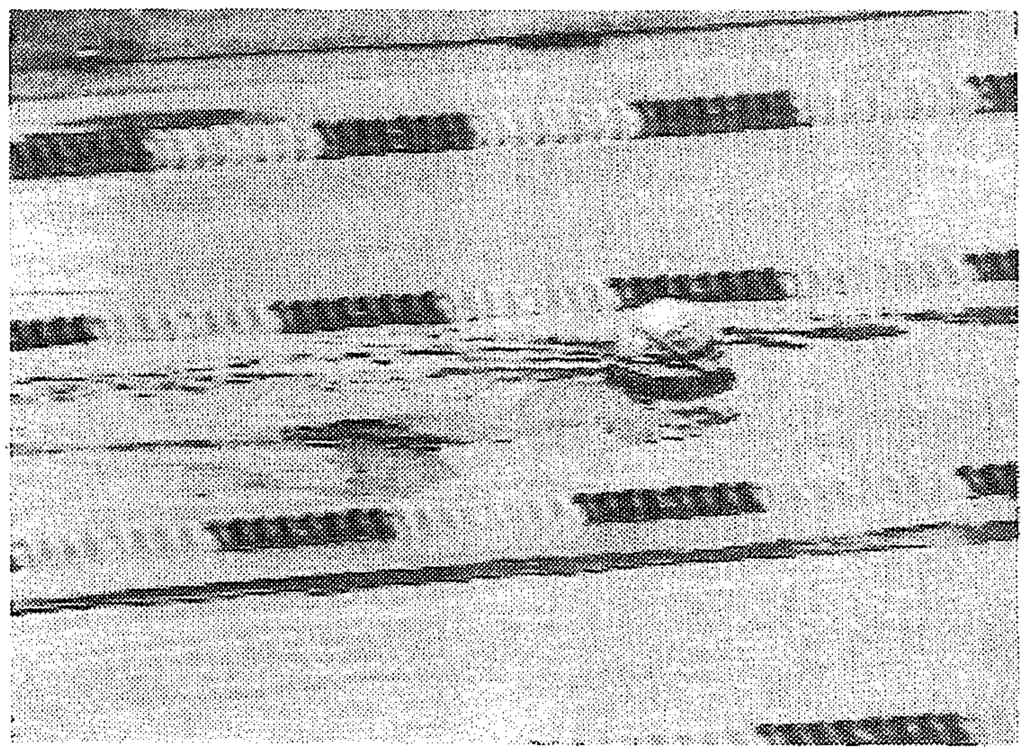

Photo.1 The swimmer did not try to breathe, but still moved his limbs slowly.
Master swimmers on the verge of drowning are unable to properly swim, even though they move their limbs vigorously.

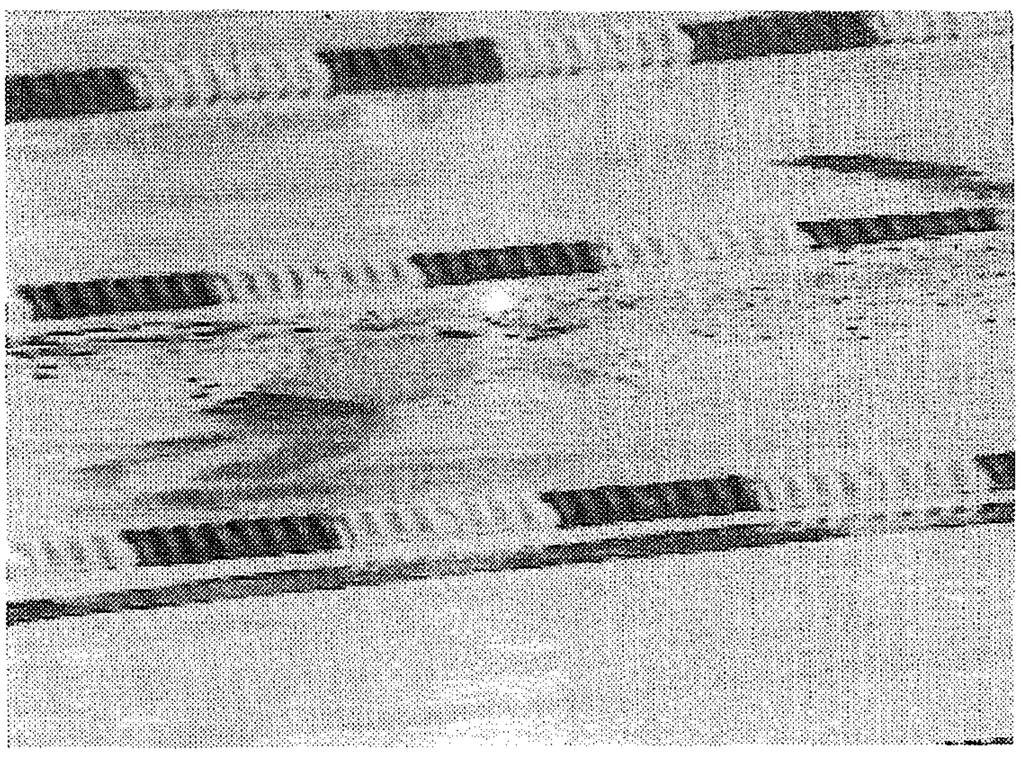

Photo.2 The swimmer stopped moving and starts to sink.
The swimmer did not show any evidence of breathing difficulties or panic before he started to drown and he began to sink without a struggle.

diffculties or show panic befofe he started to drown.

We do not feel that bleeding in the cones causes an equilibrium disturbance that results in fainting, since swimmers in the video did not show any evidence of breathing difficulties or panic.

If good swimmers were to become dizzy, they would show signs of floundering or abnormal movements before he started to drown. In the videotaped cases of a drowning in progress, no evidence of dizziness was seen, so that we must rule out an equilibrium disturbance as being a direct cause.

Viewed from No-panic syndrome, since hyperventilation lowers the carbon dioxide concentration in the blood, swimmers who have hyperventilated before plunging into the water feel little or no choking sensation from carbon dioxide build-up while submerged, and thus could lose consciousness due to a lack of oxygen. Because of the tenseness of a competitive event, many master swimmers tend to hyperventilate prior to their match. Further, since older swimmers are less able to endure prolonged periods without oxygen, they are more prone to lose consciousness and succumb to No-panic syndfome. That's why swimmers should not exercise too strenuously before entering the pool, since it may cause them to hyperventilate. Elderly swimmers should refrain from diving, since this can become No-panic syndfome or raise their blood pressure. However, we feel that drowning of an expert swimmers is not limited to one cause but that other interrelated factors are also involved.

3. Preventive and Safety Measures for the Accidents of the Masters' Meets

The present study confirms that the following rules should be used, so as to help prevent accidents occurring to the middle-aged and elderly during swimming meets.

1) Swimmers should be regularly reminded their physical condition

We must mention about the physical condition of the victims prior to the start of their meets. A swimmer in Case 2did not sleep well the night before, due to the tension of competing in the

meet. Swimmers should be regularly reminded that they should take care of their health and that they should not enter the pool if they do not feel physically fit. Master swimmers should undergo regular medical checkups and this health records of each participant should be in quick access.

2) Swimmers should warm-up appropriately before swimming and rest quietly after.

A swimmer in Case 2 plunged into the meet without warming up, since he had been delayed by traffic. Swimmers should warm-up before swimming. However swimmers should not exercise too strenuously before entering the pool, since it may cause them to hyperventilate. And master swimmers should refrain from diving to avoid "no-panic syndrome".

3) The stretcher for use in swimming pool should be available in case of accidents.

These video photos have shown the difficulties involved with physically handling a drowning victim. We should mention that it is not easy to lift a drowning person from a pool. In Photo.3, as he began to sink, a lifeguard plunged into the pool to save him (Photo.3). In Photo,4, others joined him in the pool to turn the victim onto his

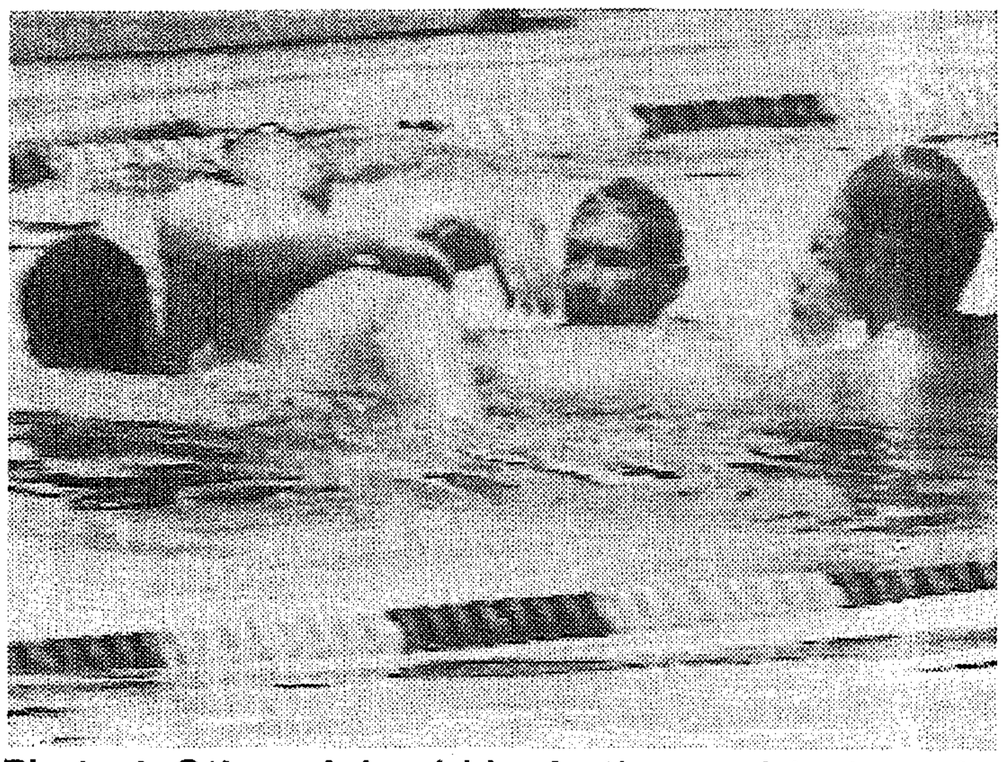

Photo.4 Others joined him in the pool to turn the victim onto his back.
We can realize how difficult it was to pass the man over the rope of the lane.

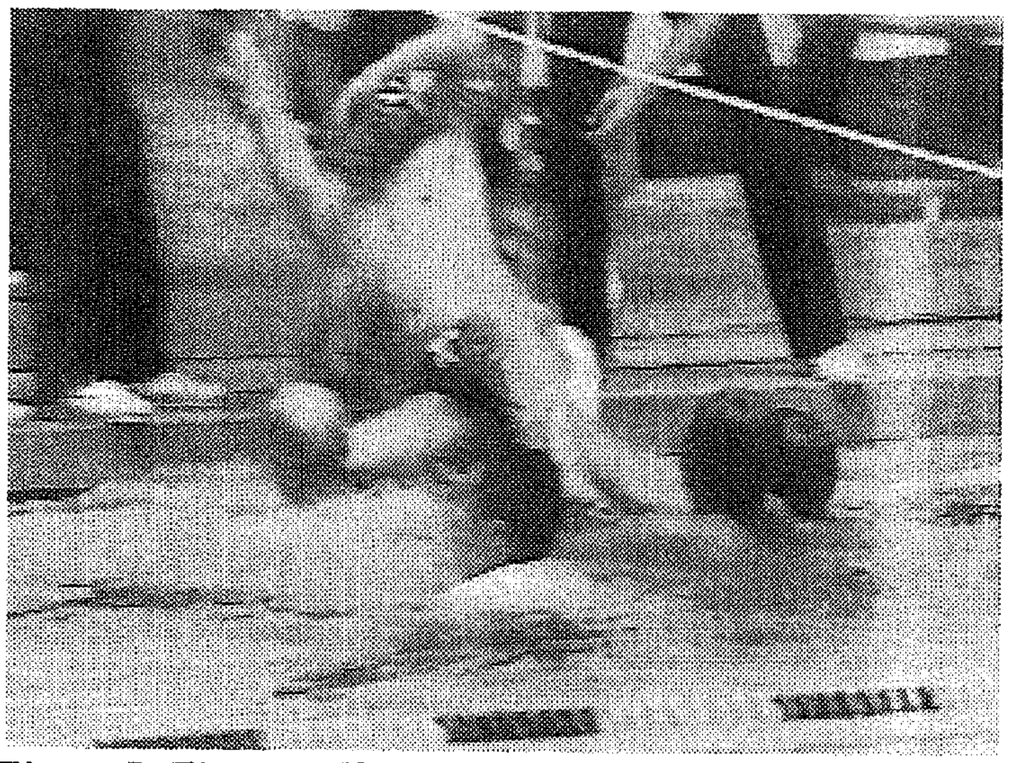

Photo.5 The stuffs and other swimmers finally succeeded in lifting the victim onto the side of the pool.

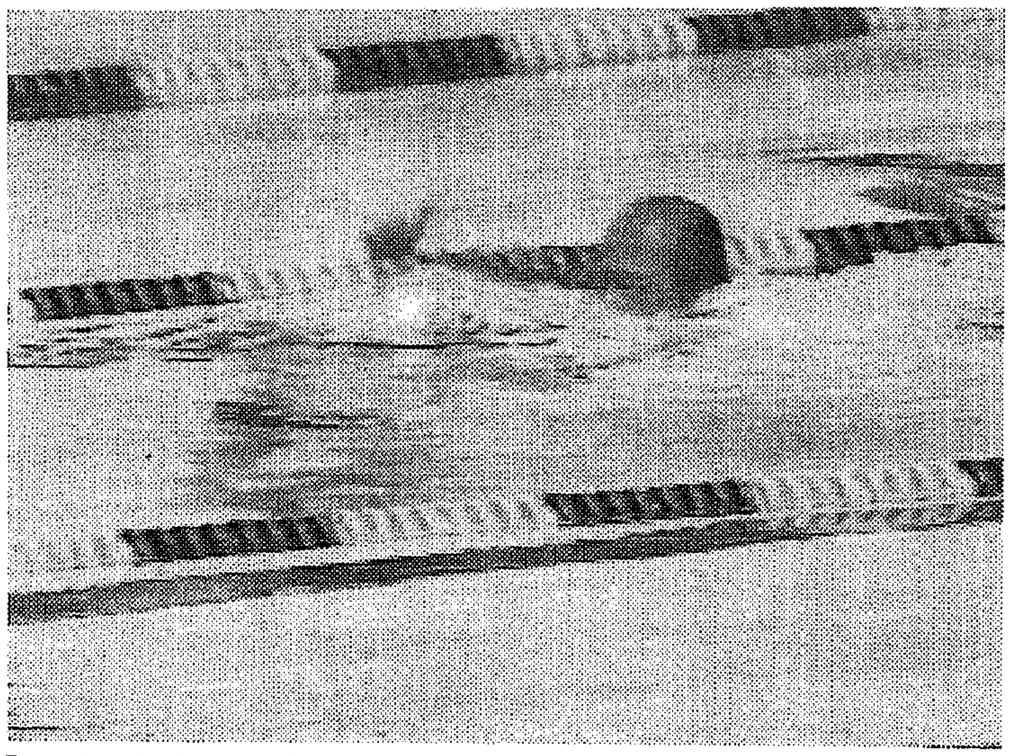

Photo.3 As he began to sink, a lifeguard plunged into the pool to save him.

Photo6 The officials are about to carry the victim to an ambulance.
Since they hadn't put the victim on the stretcher in the pool, lifting him was difficult.

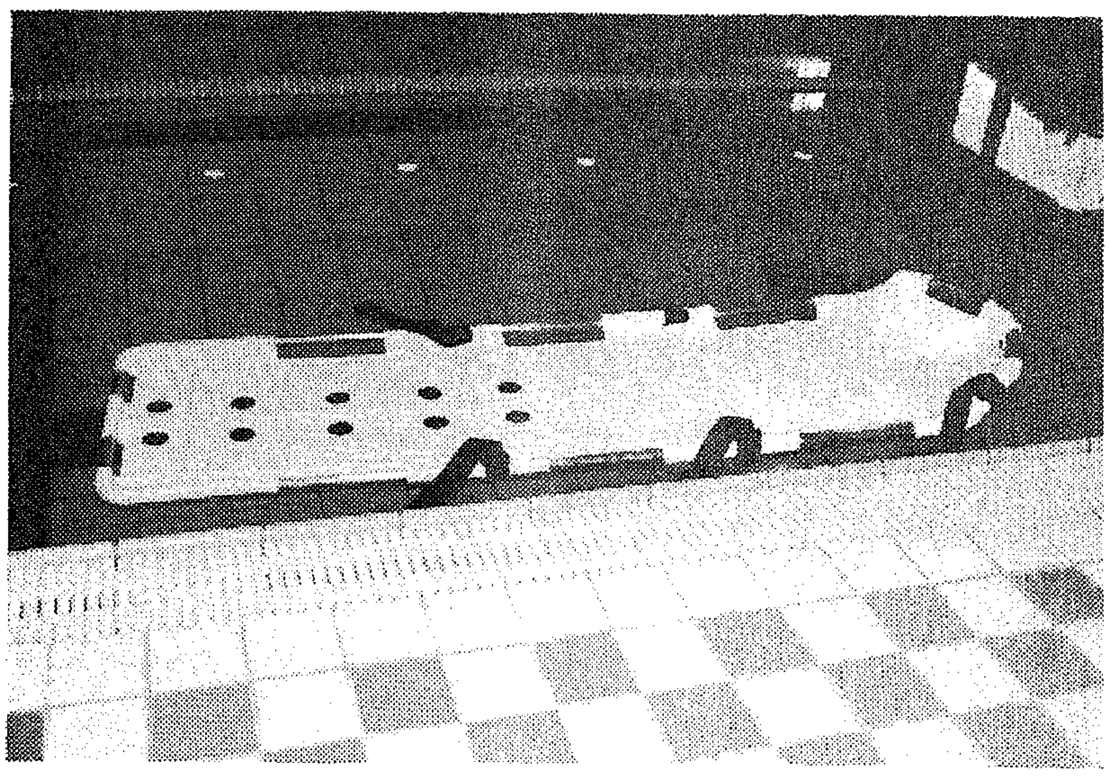

Photo.7 A floating stretcher for use in swimming pool, "Aqua Carry"
This photo is lightweight, floating stretcher called "Aqua Carry", which is recommended by the Japan Swimming Federation.

back (Photo.4). We can realize how difficult it was to pass the man over the rope of the lane. ln Photo.5, they finally succeeded in lifting the victim onto the side of the pool (Photo.5). In Photo.6, the officials are about to carry the victim to an ambulance. Since they hadn't put the victim on the stretcher in the pool, lifting him was difficult (Photo.6). The floating stretcher for use in swimming pool should be available in case of drowning accidents (Photo.7) .

4) Lifeguards and coaches should be well acquainted with the swimming styles of swimmers.

Lifeguards should be pool side and carefully observe all events. Coaches well acquainted with their swimming styles, so that they will be able to detect by unusual movement. They should be regularly reminded that water in the pool is kept at a proper swimming temperature because water that is too cold can raise their blood pressure for the elderly.

5) A first aid kit should be handy in masters' meets.

Accidents at masters' meets can differ from those that occur during swimming practice sessions. ln our survey[6] in the masters' meets, accidental abrasions or bruises occurred frequently, and remarks such as" I hit my hand while making a goal touch", "I bruised my hand from the rope of the swimming lane", "I slipped by the pool", or"The nails of the swimmer in next line to me scratched my arm".

Conclusion

1.The drowning of an expert swimmers is not limited to one cause. However, according to our video-analysis of swimmers' movement on the verge of drowning, the possibility exists that swimmers lose consciousness by the mechanizm of No-panic syndrome.

2. These video photos have shown the difficulties involved with physically handling a drowning victim.

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