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## OR-02

### Hyperbaric Oxygen Therapy in Athletes with Medial Collateral Ligament Injury of the Knee

#### 高压氧治疗膝关节内侧副韧带损伤

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**OBJECTIVES** Medial collateral ligament injury of the knee is a major ligament injury associated with sports activity. Hyperbaric oxygen therapy (HBO) reduces edema after injury and progresses the scar tissue in injured medial collateral ligament in rat model. The purposes of this study were to evaluate the effects of HBO on recovery acceleration in athletes with medial collateral ligament injury of the knee.

**METHODS** First, 10 patients, who involved isolated medial collateral ligament injury in sports activity and admitted to our hospital within 7 days after injury, were included in this study. The patients were administrated to HBO of 2.8 ATA for 1 hour from once to 7 times. At the time of pre-treatment and post-treatment, visual analog scales (VASs) regarding with rest pain, motion pain, and patients' subjective evaluation of edema were measured 38 times in 10 patients. Second, 31 Japanese professional and semi-professional rugby players with 2nd grade medial collateral ligament injury were evaluated. Fifteen players were applied with HBO and 16 players without HBO, and recovery time from injury to return to match was compared.

**RESULTS** The VAS values at pre-treatment and post-treatment were respectively 14.1 points and 12.9 ( $P > 0.05$ ) in rest pain, 33.8 points and 28.6 ( $P < 0.01$ ) in motion pain, and 27.2 points and 21.6 points ( $P < 0.001$ ) in patients' subjective evaluation of edema. Recovery times from injury to return to match were 31.3 days in HBO group and 42.6 days in non-HBO group ( $P < 0.05$ ).

**CONCLUSIONS** In VAS evaluation, HBO was effective on motion pain and edema comparing with pre-treatment and post-treatment. In consideration of recovery time, HBO was effective for recovery acceleration in athletes with 2nd grade medial collateral ligament injury of the knee.

## OR-03

### Experience of Health Surveillance scheme in high working pressure for modern Compressed Air Work tunnelling

#### 在高气压环境下工作人员的医疗保健经验

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In Hong Kong Modern Compressed Air Work began in 1999 with the first Tunnel Boring Machine (TBM) employed in a railway project.

Today, TBM can build tunnel diameter range from 6 to 21 meter. Tunnel boring machines are used as an alterna-

tive to drilling and blasting (D&B) methods in rock and conventional "hand mining" in soil. TBM have the advantages of limiting the disturbance to the surrounding ground and producing a smooth tunnel wall. This significantly reduces the cost of lining the tunnel, and makes them suitable to use in heavily urbanized areas. In the past fourteen years, there were more than ten tunnels under compressed air in Hong Kong built with this modern tunnel boring machine. The maximum working pressure at 4.2bar with "zero" Decompression Illness case with an exceptional case related to heat strain under compressed air work. This article brief the health surveillance scheme employed in on the two high working pressure TBM tunnels. Pre-employment examination standards & principles from commercial diver adopted for the selection of suitable compressed air workers. Three oxygen decompression tables applied in the two high working pressure tunnels respectively at 4.2bar and 4.0bar. They are namely French Oxygen Decompression Tables, a German variance -Hamburg Table and an Air/Oxy12M -a modified COMEX diving table with oxygen decompression. Monthly medical examination comes with regular physical fitness assessment. Strict alcohol and drugs free policy also applied.

#### OR-04

### The effects of hyperbaric oxygen (HBO) pretreatment on human physiological functions and labor ability under acute hypoxic exposure 高压氧干预对人体急性低氧的生理、生化反应和劳动能力的影响

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**Objective** To study the effects of hyperbaric oxygen (HBO) pretreatment on human physiological functions and labor ability under acute hypoxic exposure. Methods Eight male volunteers participated this research. We tested the physiological parameters respectively when they were at sea level, 4000 meters acute exposure in low pressure chamber, before and after physical load. All subjects underwent stepping-stool exercise for physical load at different conditions. Heart Rate (HR) and oxygen saturation (SaO<sub>2</sub>) were tested before and after the exercise. We also collected blood to test superoxide dismutase activity (SOD), blood lactic acid content (BLA), interleukin-6 (IL-6) and matrix metalloproteinase-9 (MMP-9).

**Results** (1) Comparison with the sea level, SaO<sub>2</sub> decreased significantly before physical load at 4000 meters ( $P < 0.01$ ), BLA content increased significantly ( $P < 0.05$ ). IL-6 and MMP-9 increased significantly ( $P < 0.05$ ). HR had increasing tendency compared with the sea level, while SOD activity and work efficiency had declining tendency. (2) After physical load at 4000 meters, BLA content increased significantly ( $P < 0.05$ ), and SaO<sub>2</sub> decreased significantly ( $P < 0.01$ ). HR had increasing tendency compared with the sea level, SOD activity and work efficiency had declining tendency. After HBO pretreatment, BLA content during physical load decreased significantly ( $P < 0.05$ ); and work efficiency after physical load increased significantly ( $P < 0.05$ ). Compared with the hypoxic condition, HR had declining tendency, SOD activity and work efficiency had increasing tendency. IL-6 and MMP-9 significantly decreased compared with the acute hypoxic exposure before HBO pretreatment.

**Conclusions** HBO pretreatment could improve SaO<sub>2</sub> and increase blood oxygen partial pressure, it also could