The Effect of Regional Hypothermia of Neuromuscular Transmission

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To determine the influence of hypothermia on the neuromuscular transmission, 25 patients were studied during O_2-N_2O(50%)-enflurane(1-2%) anesthesia without any muscle relaxants. Ventilation was controlled to maintain normocapnia and neuromuscular transmission was monitored by delivering train-of-four (TOF) stimuli to the ulnar nerve at wrist (Accelograph, Biometer) while the circulation to the ipsilateral forearm was occluded by tourniquet for 20 minutes. Regional hypothermia was induced to the isolated arm by intravenous injection of 20ml normal saline cooled by 10°C and by surface cooling with ice pack in 15 patients (hypothermia group). To compare the neuromuscular transmission in hypothermia with 10 patients in normothermia whose temperature were maintained at normothermia by intravenous injection of 20ml normal saline of 36°C (normothermia group). TOF response was measured following temperature gone down. The results obtained were as follows.

First twitch height of TOF response (T1) was not changed, significantly in normothermia group for 20 minutes. In hypothermia group, T1 was decreased insignificantly until the temperature fell to 32°C, but it began to decrease significantly from below 31°C as compared to normothermia group, e.g., 82.4±12.1% (p<0.05), 73.1±29.6% (p<0.01), 53.2±14.4% (p<0.01), 38.7±18.7% (p<0.01), and 35.9±16.3% (p<0.01) at 31, 30, 29, 28 and 27°C respectively. T1 ratio was not affected in both normothermia and hypothermia groups. In 5 cases of 15 hypothermia patients, we observed transient increase of T1 under the moderate hypothermia (35~32°C) before markedly diminution of T1 under the profound hypothermia (<31°C).

Key Words: Hypothermia, Neuromuscular transmission
추천강의따라서영안은신경근전달과정의변화를반치의부위적측은하여보았기에문헌적고찰과함께보고하는바이다.

연구대상 및 방법

미국 마취과학회 회원분류 1 또는 2급에 해당되고신경근기능에영향을미칠요소가있으며수술중근
이완제를필요로하지않는성인남녀방사15명을대
상으로하였다.마취전투약으로hydroxyzine1.5
mg/kg와atropine sulfate0.5mg을마취유도1시
간전에각각주ijklj하였다.마취는thiopental sodium
5mg/kg와suxcinylcholine1mg/kg를정주한후
기관내습관과O₂-N₂O(50%)-enflurane(1~2%)
을흡입시키면서호흡이상황감소분압(car-Os,
Datex)이35~40 mmHg가유지되도록조절효시
켰다.
신경근전달과정은Accelograph(Biometer)을이
용하여,손목에있는척추신경에60mA,2Hztrain-
of-four(ToF)자극을15초간격으로가하고add-
ductor pollicis 근반응을연속으로감시하였다.
Suxcinylcholine 투여후TOF 반응의첫번째연속
높이(T₁)와T₁에대한T₀의비(TR)가100%최북되
어일정하게유지될때동축전반과손울네각시키기
시작하여체온하강에따르는T₁ 및TR을관찰하였다.
부위적측은네각방법은표면inear법으로네각수와
얼굴주머니를사용하였으며보다신속히네각시키기
위하여상박을구획대로입박하여체온과차단하고
원위부의정맥을 통하여10°C내외의생리시험수
20ml을주입하였다.체온측정의정확성을기하기위
하여Datascop 2100에부착된피부보안전자체온
기의감지한을adductor pollicis 표면내피부부착하
고네각수와얼굴주머니가접촉없게하게하였으
며구획대말막시시간이20분이넘지않은범위에서
네각시켰다.

본실험결과와비교하여보기위하여10에에서상
박을동일한방법으로체온과차단하고원위부의
정맥에약36°C의생리시험수20ml을주입하여정
상체온을유지시킨대상에서20분간T₁ 및TR을관
찰하였다.

측정치의통계학적검정은student’s t-test로하

Fig. 1. Comparison of the changes of first twitch height(T₁) of TOF under the normothermia (●) and hypothermia(*) during 21.04 ± 2.1 minutes of tourniquet time(TT)

또한 p치가0.05이하인경우를의의있는것으로판
정하였다.

연구성적

대상환자는남자가11명,여자가4명이었으며평균
연령은34±11.4세,평균체중은62±8.8kg그리고
수술은자지에극한된정형외과수술이었다.

상박을구획대로입박하여체온과차단하고표면
네각을시키지않은상태에서원위부의정맥에약
36°C의생리시험수20ml을주입하여정상체온을유
지시킨10에에서20분간T₁ 및TR의변화를
관찰한결과T₁ 및TR 모두10%내외의상승만보
였을뿐통계학적으로의의있는차이는불필요
다(Table 1 및Fig. 1).