Postoperative Delirium

Protocol essay

Submitted for Partial Fulfillment of
Master Degree in anesthesiology

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Finally I would like to dedicate this piece of work to my family.

Heba Abbas Abd El Aziz

List of abbreviations

-**Ach** : Acetyl choline

-**APO** : Apolipoprotien

-**ATMS** : Abbreviated mental test score

-**ATP** : Adenosine triphosphate

-**BDS** : Blessed dementia scale

-**BRS** : Behavior rating scale

-**BSI** : Bispectral index

-**CAM** : Confusion assessment method

-**CAS** : Cognitive assessment scale

-**CBF** : Cerebral blood flow

-**CNS** : Central nervous system

-**DA** : Dopamine

-**DOS** : Delirium observation screening scale

-**DSM** : Diagnostic and statistical manual of mental disorders

-**EA** : Emergency agitation

-**EC** : Endothelial cells.

-**ED** : Emergency delirium

-**EE**G : Electroencephalogram.

-**GA** : General anesthesia

-**GABA** : Gamma amino butyric acid.

-**ICU** : Intensive care uni

-**IMCT** : Information memory concentration scale

-**ISPOCD** : International study of postoperative cognitive dysfunction

-**MAP** : Mean arterial pressure

-**MCR** : Muscarinic receptors

-**MMSE** : Mini mental state examination

-**MSQ** : Mental state questionnaire

-**NCR** : Nicotinic receptors

-**PaCo2** : Arterial carbon dioxide tension

-**PFC** : Prefrontal cortex.

-**POD** : Postopertaive delirium.

-**POCD** **:** Postopertaive cognitive dysfunction

-**RA** : Regional anesthesia

-**REM** : Rapid eye movement.

-**TIVA** : Total intravenous anesthesia

-**VAS** : Visual analogue scale for confusion

-**WMS** : Weschler memory scale

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الملخص العربي

على مدار أكثر من خمسين عاما سابقة، لاحظ الأطباء حدوث تغيرات في الوظائف العقلية في فترة ما بعد التخدير والعمليات الجراحية خاصة في كبار السن، و بسبب زيادة هذه التغيرات خاصة بعد تقدم الخدمة الصحية و العمليات الجراحية المقدمة لكبار السن، تم تقسيم هذه التغيرات إلى ما يسمى بالهذيان و الخلل الادراكي المصاحب للعمليات الجراحية.

لأسباب الباثوفيسيولوجية للهذيان ما بعد العمليات الجراحية مازالت غير معروفة على وجه التحديد و لكن من أكثر النظريات المقبولة علميا في تفسير هذه الظاهرة هي حدوث إختلال في كثير من الموصلات العصبية المركزية خاصة نقص مادة الاستيل كولين مع الارتفاع النسبي في مادة الدوبامين.

الهذيان المصاحب لما بعد العمليات الجراحية يعتبر واحدا من أكثر المضاعفات خطورة بعد العمليات الكبرى، حيث أنه مرتبط بزيادة فترة المرض و معدل الوفيات و طول مدة الإقامة بالمستشفيات إضافة لارتفاع التكاليف و الجهد للفريق الطبي سواء أطباء أو تمريض.

يعرف الهذيان المصاحب لما بعد العمليات الجراحية بأنه تغير في الحالة الذهنية مصحوبا بنقص في الوظائف الإدراكية و اختلال في الانتباه و درجة الوعي بالنسبة للبيئة المحيطة.

و هذا الهذيان يظهر في صورة مفاجأة و حادة في خلال ساعات أو أيام بعد العملية الجراحية ويتأرجح في شدة الأعراض في خلال نفس اليوم و لكن تتحسن هذه التغيرات الذهنية في خلال أيام و رغم ذلك تبقى بعض هذه الأعراض لمدة أسابيع و ربما شهور.

التنبؤ بحدوث هذيان للمرضى كبار السن بعد العمليات الجراحية يعتمد على التفاعل بين: العوامل المهيئة المصاحبة للمريض قبل تواجده بالمستشفى و العوامل المسببة التي قد تحدث أثناء أو ما بعد العمليات الجراحية.

لتشخيص الاكلينيكي للهذيان يعتمد على التاريخ المرضي من الأقارب المحيطين و على الفحص الإكلينيكي اللذان يساعدان في الوصول للعوامل المسببة للهذيان.

وهناك العديد من الاختبارات العصبية و النفسية التي استخدمت في تشخيص الهذيان و الخلل الإدراكي للمريض و أيضا في استبعاد الأسباب النفسية و العصبية الأخرى التى قد تتشابه مع الهذيان و خاصة في كبار السن.

الخلل الادراكي المعرفي ما بعد العمليات الجراحية يوصف بأنه اضطراب في الوظائف الذهنية و العقلية التي ترتبط بصورة مؤقتة بالجراحة و لكن لابد من التفرقة بين الهذيان الذي قد يحدث للمرضى بصورة طارئة و بشكل متذبذب و بين الخلل الادراكي الذي يستمر لفترة أطول.

و يعتبر الخلل الإدراكي شائع الحدوث لكل المرضى عند الخروج من المستشفيات بعد إجراء العمليات الجراحية الكبرى و لكن كبار السن فقط (٦٠عاما و ما فوق) أكثر عرضة للخلل الإدراكي الذي يستمر لفترات طويلة.

هناك العديد من الأبحاث و الدراسات التي اختبرت تأثير التخدير الكلي على حدوث الهذيان والخلل الإدراكي المعرفي مقارنة بالتخدير الجزئي ولكن الغالبية العظمى لنتائج تلك الأبحاث أثبتت عدم وجود فرق يذكر في تأثير أي منهما على تلك المضاعفات موضحا أن الخلل الإدراكي يمكن أن يكون ناتجا عن الحالة الصحية العامة للمريض أكثر من تأثير الجراحة نفسها أو التخدير.

Introduction

More than 50 yr ago, clinicians reported changes in mental function after anesthesia and surgery in the elderly. As these phenomena have been elucidated in subsequent years, they have been categorized into the distinct syndromes of postoperative delirium(POD) and postoperative cognitive dysfunction (POCD) **(Jeffrey et al., 2007).**

Delirium was well described in the writings of Hippocrates 2,500 yr ago.The word delirium is derived from the Latin term meaning off the track ***(Aakerlund et al., 1994)*.**

Delirium is an acute neurobehavioral syndrome associated with disturbances in consciousness and attention which results from an underlying medical condition, medication or drug withdrawal **(Dyer, 1995).**

Postoperative delirium usually occurs 24-72 hours postoperatively and resolves within hours to days. In contrast, postoperative cognitive dysfunction is noticed weeks to months after surgery. The causes of these CNS dysfunction forms are not yet fully understood **(Chung, 1997).**

The key diagnostic features of POD are:

- It's a change in mental status characterized by a prominent disturbance of attention and reduced clarity of awareness of the environment **(Jeffrey et al., 2007).**

- It has an acute onset, developing within hours to days, and tends to fluctuate during the course of the day. The inability to focus, sustain, and shift attention is accompanied by other cognitive symptoms (*e.g.*, disorientation, episodic memory dysfunction) and/or perceptual disturbances

(misinterpretations, illusions, or hallucinations),other associated features include disturbances of the sleep–wake cycle and activity level, as well as affective disturbance (mood lability, anger, sadness, euphoria) and thought disorder (disorganized thinking, delusions). The symptoms of delirium are numerous, vary from patient to patient, vary within patients over time, and are shared by a variety of other disorders such as dementia, anxiety, depression, and psychosis, all of which contribute to difficulties in diagnosis **(Jeffrey et al., 2007).**

Indications for surgical treatment of the elderly patients have been increasing continuously and postoperative central nervous dysfunction, including delirium, is one of the most common complications in elderly surgical patients **(Chung, 1997).**

Despite the distinguishing characteristics of POD and POCD, it is important to consider that there may be an association between them. Postoperative delirium may be a harbinger of POCD or an emerging dementia **(Jackson et al., 2004).**

Postoperative delirium (POD) represents one of the threatening complications in the perioperative course of patients undergoing major surgery. patients suffering from delirium have higher postoperative morbidity and mortality, as well as longer ICU and hospital stay, which results in higher hospitalization costs. Moreover, POD although reversible in nature – recedes with cognitive deficits remaining up to weeks after surgery **(Mast, 1998).**

In elderly patients, the risk of developing delirium while hospitalized is predicted by an interaction between vulnerability factors present at the time of hospitalization and noxious injuries, or precipitating factors that occur during hospitalization **(Inouye, 2006).**

Delirium in the postoperative period can be divided into emergence delirium and postoperative delirium (POD), based on the time of onset. Emergence delirium is seen during or immediately after emergence from general anesthesia and usually resolves within minutes or hours. It occurs in all age groups, with some predominance in children **(Kain, 2004).**

After a lucid interval, some patients develop a syndrome referred to as interval delirium or postoperative delirium. Postoperative delirium tends to first be observed between postoperative days 1 and 3, and usually resolves within hours to days, although symptoms may persist for weeks to months with more prevalence in elderly people **(Cole, 2004).**

The underlying pathophysiology of delirium in general and POD specifically, remains elusive. Delirium is the behavioral manifestation of diffuse cortical dysfunction and is associated with diffuse slowing of background activity in the electroencephalogram and associated with disturbances in a wide variety of neurotransmitter systems, and disruption of cholinergic transmission seems to be especially important **(Inouye, 2006).**

Pathophysiology of postoperative delirium.

The Neuroanatomy of postoperative delirium:

Delirium has been considered a syndrome of generalized dysfunction of higher cortical functions due to its breadth of symptoms and associated diffuse slowing on electroencephalogram **(Trzepacz , 1994).**

Advances in neuropsychiatry have revealed differences between brain regions, including the hemispheres, which may underlie the constellation of symptoms among different psychiatric disorders. For example, different neural pathways are involved in major depression and obsessive-compulsive disorder, including lateralization to one or the other hemisphere. Delirium involves particular neural pathways and that lateralization to the right may be relevant **(Stone , 1996).**

Structural and functional neuroimaging reports and neuropsychological studies support this lateralization. Prefrontal cortices, anterior and right thalamus, and right basilar temporoparietal cortex may play a significant role in subserving delirium symptoms and may be the 'final common pathway' for delirium from a variety of etiologies. The final common pathway may be responsible for certain 'core symptoms' (disorientation, cognitive deficits, sleep-wake cycle disturbance, disorganized thinking, and language abnormalities), while other symptoms (delusions, hallucinations, illusions, and affective lability) may occur depending on the etiology causing delirium **(Schubert , 1997).**

Delirium is felt to represent a generalized dysfunction of higher cerebral cortical processes. Supporting this notion; electroencephalograms (EEGs) in delirious patients characteristically show diffuse slowing of the dominant posterior rhythm, consistent with widespread cortical

dysfunction. Delirium involves deficits in a variety of cognitive functions (not just attention) as well as other neuropsychiatric symptoms such as disturbances in affect, thinking, language and sleep-wake cycle **(Trzepacz , 1994).**

The specific neuronal pathways that cause delirium are unknown. Because a variety of physiological and/or structural abnormalities can cause delirium, it is suggested that particular brain regions or circuits affected by these many different etiologies may constitute a 'final common pathway' for the syndrome of delirium **(Cucchiara et al., 1998).**

Delirium is a brain disorder affecting areas of the brain serving behavior, thought and cognition. Any primary motor or sensory abnormalities appear only as a result of the specific underlying medical problem (e.g. stroke, tumor, liver insufficiency).Focal neurological signs have not been found to be part of the delirium syndrome. This implies that the brain regions involved in causing delirium are areas other than those involved in supporting primary motor and sensory functions **(Doyle and Warden, 1996).**

This is not to suggest that delirium can only occur after structural damage to these regions; rather, these regions may represent the most vulnerable or the 'final common' neural pathways for causing delirium symptoms resulting from many different structural or physiological effects on the brain **(Doyle and Warden, 1996).**

Neurochemistry of postoperative delirium

Almost nothing is known about pathophysiological mechanisms in delirium, and pathogenetic hypotheses are speculative and largely based on animal research **(Mast, 1998).**

1-Neurotransmitter hypothesis: