Remifentanyl Infusion Intraoperatively Decreased the Total Dose of Atracurium Required for Recipient in Renal Transplant Surgery

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ABSTRACT:

BACKGROUND:

Renal failure is a disease characterized by loss of renal function and it affects all body systems.
Anasthesia for renal transplant recipient needs skill and care to manage the abnormal systemic presentation of patient.
Anesthetic plan is affected by renal failure and effects appear by anesthetic drugs choices, doses, and combination. This Anasthetic plan also affected by the cause of renal failure, drugs therapy, dialysis, and duration of disease.

OBJECTIVE:

To assess the effect of remifentanyl infusion on total dose of atracurium required during renal transplant surgery.

METHOD:

Between ١st January-٢٠١١ to ١st February-٢٠١٣, in renal transplant center, medical city-Baghdad-Iraq, and hundred patients had renal transplant. All patients had received midazolam (٠,٠٥Mcg/kg), fentanyl (١Mcg/kg), propofol sleeping dose (١-١,٥mg/kg) and atracurium (٠,٦mg/kg) then intubated.
Fifty patients were maintained with isoflurane (٠,٥-١ MAC), boluses of atracurium. Other fifty had same maintenance with addition of remifentanyl infusion using infusion pump in dose of (٠,٠٥-٠,١Mcg).

RESULT:

Group with remifentanyl needed less dose of atracurium than group without remifentanyl. Mean dose for group with remifentanyl was (١,٢٥٥mg/kg) while for group without remifentanyl was (١,٦٢٣mg/kg).
Mean time for surgery in both groups was approximately equal, in group with remifentanyl time was (١٧٢,١٦min), and other group was (١٧٤,١٦min).

CONCLUSION:

Remifentanyl infusion decrease the dose of neuromuscular blocking agents required and may abolish it but blood pressure and pulse rate should monitored carefully.

KEY WORDS: remifentanyl, renal transplant, atracurium, isoflurane.

ITRODUCTION:

Renal failure is a disease with many systemic manifestations and transplant surgery is treatment for patients with chronic type of renal failure, in these surgeries: recipients have alteration in all body systems due the renal failure [١], and this alteration comes from the etiology of disease, disease itself, complications of both disease and its cause, alteration also comes from management of disease regarding dialysis, drug therapy. And this alteration will affect the anesthetic plan for recipients, all anesthetic drugs should be independent on renal system in order to be used for recipients [٢,٣,٤,٥,٦,٧,٨].

Anasthetic agents which had been used in this study were proved to be save in recipient patients (midazolam, fentanyl, propofol, atracurium, isoflurane, remifentanyl) [٨].

Remifentanyl is a new ultra short acting opioid and eliminated without residual effect [٢-٩], atracurium is neuromuscular blocking agent with metabolism by Hoffman degradation and ester hydrolysis for more than٥٠٪ of dose [١٠].

These features of remifentanyl and atracurium make them suitable choice for recipient's anasthesia in renal transplant surgery [٢,٤].

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Isoflurane is one of safest inhalational agents in renal failure patients with its short duration and no renal effect and easy dose manipulation and low fluoride concentration residual lead it to be commonly used in renal failure patients in both for renal transplant as recipient or renal failure patients for non-transplant surgery[٧].

In this study remifentanyl effect on atracurium dose during surgery was studied and compared with other studies.

METHOD:

During period from ١st January -٢٠١١ till ١st February ٢٠١٣ in renal transplant center in medical city –Baghdad, Iraq. Hundred patients with chronic renal failure had renal transplant surgery receiving kidney from living donor because Iraqi laws prohibited cadaveric donation. All these recipients were prepared electively by transplant team (nephrologist, surgeon and anesthetist).

This is an experimental study enrolled ١٠٠ patients divided into two groups :

groupA- fifty patients were received remifentanyl.

groupB- fifty patients were not received remifentanyl.

Age of patients was between ١٨-٥٠ years, all are Iraqi people recipients and donors. All patients had received full explanation regarding Anasthetic options and possible complications before getting consent.

All surgeries were done under general anasthesia in supine position with monitors and anesthetist presence whole time.

All patients had preoxygented with ١٠٠٪ oxygen by face mask in spontaneously breathing manner for ٣-٥ minutes. All patients were given metoclopramide, cimetidine and dexamethasone as premedication according to body weight. All of patients also were given ٢-٣ mg midazolam and ٣٠-٦٠mcg fentanyl pre-induction.

Induction was undertaken using propofol sleeping dose, atracurium ٠,٦mg/kg then intubation done with disposable endotracheal tubes, then volume controlled mechanical ventilation was used for anesthesia. Maintenance of anesthesia was different by dividing patients into two groups:

Fifty patients were received isoflurane and boluses of atracurium as maintenance regime. (Group A)

Other fifty patients were received isoflurane, remifentanyl infusion using infusion pump and boluses of atracurium as maintenance regime. (Group B)

In (group A) isoflurane dose adjusted according to blood pressure response, (mean arterial pressure was kept above ٨٠mmhg but we kept it not more than ٢٠٪ from admission), and we gave atracurium boluses (٢٠٪) from ١st dose when there was detection of diaphragm movement by ventilator monitor for intrapulmonary pressure wave change.

In group B isoflurane and atracurium dosage were adjusted on the same principle of group A, but here use of remifentanyl infusion led to decrement in doses of isoflurane inhaled in order to keep mean arterial blood pressure above ٨٠mmhg, also remifentanyl doses adjusted to keep pulse rate above ٦٠/minute. (We used atropine in two patients to keep pulse rate above ٦٠).dose of remifentanyl infusion was between ٠,٠٥ -٠,١microg/kg/min according to response.

At the end of surgery in group A we decreased isoflurane dose till there sign of spontaneously breathing then we give reversal (neostigmine, atropine).

At the end of surgery in group B we stopped remifentanyl and decreased isoflurane dose and process continued as in group A.

There was four patients in (group A) needed ٢nd dose of reversal but no one in group B.

All patients in the two groups had received analgesia immediately postoperatively, but no one of them had bad back recall or complained of awareness during anasthesia.

Statistical analysis:

Data were entered into a computer using statistical package for social sciences (spss,version ١٩).

Comparison between groups' results was performed by using student test (t-test).values of P<٠,٠٥ were considered statistically significant.

RESULT:

There was no significant difference between the two groups regarding age, sex, ASA physical status (all of patients were class II-III).

Surgery mean time was approximately the same, for group A was١٧٤,١٦ min. and for group B (using remifentanyl) was ١٧٢,١٦ min.

Group B with remifentanyl needed less dose of atracurium at the end of surgery (mean of dose was ١,٢٥٥ mg/kg) than that for group A without remifentanyl (mean of dose was ١,٦٢٣ mg/kg). This difference was statistically significant with (p<٠,٠٥). (Table -١-)

Table ١: Result of statistic of two groups: group A without remifentanyl group B with remifentanyl

	No. of patients	Mean surgery time(min)	Mean of dose (mg/kg)	Std.deviation	Std.Error mean
Group (A) without remifentanyl	٥٠	١٧٤,١٦	١,٦٢٣٠	.٣١٠٠٣٠	.٠٤٣٨٤٥
Group (B) with remifentanyl	٥٠	١٧٢,١٦	١,٢٥٥٠	.١٥٥٥٩٣	.٠٢٢٠٠٤

Remifentanyl infusion decreased the inhalational agent requirement, in group A the isoflurane concentration was between (٠,٧٥-١ MAC) while in group B was between (٠,٥-٠,٧٥ MAC). Four patients (٨٪) in group A need other dose of reversal.

All patients in both groups were in need of an analgesia immediately at the end of surgery and all of them assured that they did not complain of awareness intraoperatively.

DISCUSSION:

This study demonstrated that use of remifentanyl intraoperatively decreases the neuromuscular blocking agents requirement by potentiating its effect and prolongation the duration of action of them, which compatible with other studies,Wen LL[١١], Ozcan[١٢], Dongo Hyun [١٣] ,there are other studies indicate that remifentanyl can be used to facilitate intubation without using neuromuscular blocking agents ,Jong-Man[١٤],Hwan S.Joo[١٥].

Many neuromuscular blocking agents can be used safely in renal failure patients [٨,١٦], these neuromuscular blocking agents are known to be affected by many factors like inhalational agents [١١,١٢,١٧,١٨], calcium channel blockers nifedipine [١٩] and magnesium [٢٠].

Renal failure itself prolonged the duration of action of many neuromuscular blocking agent like vecuronium and rocuronium but not atracurium [١٦].

Inhalational agents which were used in renal transplant surgery should be safe in renal failure like isoflurane since there were other agent not save [٨], these inhalational are known to have effect on other anesthetic drugs and to be affected by them such as opioids which are known to potentiate the inhalational agents [٩] which the same results in this study.

There were four patients in group A who need additional dose of reversal due to residual effect of neuromuscular blocking agents(which suspected in patients with myopathy due to renal failure) [١-٣],for that effect trials attempted to omit use of neuromuscular blocking agents and substitute them by remifentanyl alone [٢١],or use remifentanyl with propofol to intubate patients [٢٢].

All patients needed analgesia postoperatively due fact that in group A isoflurane had no analgesic activity while in group B patients with remifentanyl infusion needed analgesia after few minutes from stopping remifentanyl at the end of surgery because remifentanyl has very short duration due to its metabolism by blood and tissue esterases [٩].

CONCLUSION:

Remifentanyl infusion decreases the requirement for neuromuscular blocking agents intraoperatively and can substitute it with better recovery state and easy dose manipulation, all these features supposed to motivate further studies and researches to optimize usage of remifentanyl in renal failure and critical cases and what are the better drugs combination should be used.

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