

Does Pulse Methylprednisolone Dosing Have an Acute Effect on Serum Creatinine Concentrations?

Eric C. Wong, BSc.(Pharm).; Glen Brown, B.Sc.(Pharm)., Pharm.D., FCSHP, BCPS

Background

- Corticosteroids such as methylprednisolone may cause an acute rise in serum creatinine (SCr)^{1,2} that could be confused clinically with worsening renal function²
- Validity of the relationship between methylprednisolone and rising SCr is unclear
- Clarifying the role of supraphysiologic, or pulse methylprednisolone dosing in causing an acute rise in SCr will limit unnecessary diagnostic tests or alterations in concurrent therapy

Objective

- To determine whether the measured SCr rises within the **1-2 day period** following administration of **methylprednisolone 500-1000 mg IV daily x 2-4 consecutive days**, as compared to the SCr prior to drug administration

Methods

- Retrospective chart review of patients at Saint Paul's and Mount Saint Joseph Hospital
- **Inclusion criteria:** Patients receiving methylprednisolone 500-1000 mg IV daily x 2-4 consecutive days (July 1, 2009 – 2013)
- **Exclusion criteria:**
 - (a) established **renal dysfunction** (SCr > 110 µmol/L or eGFR < 50 mL/min) prior to the first pulse dose
 - (b) **shock** requiring administration of vasoactive inotropes
 - (c) **dehydration** (negative fluid balance > 3 L between pre- and post- SCr measurements)
 - (d) requiring **renal replacement** therapy
 - (e) taking ≥ 1 medication with potential **nephrotoxic** effects (e.g. IV aminoglycosides, acyclovir, amphotericin B)
- **Pre-therapy** SCr was collected from the **day of the first dose** (or from the immediate prior day if unavailable)
- **Post-therapy** SCr was collected from the **day after the last dose** (or from the following subsequent day if unavailable)

Results

• Demographics

Number of subjects	57
Age (years) (Mean ± SD)	54 ± 17
Gender	
Male	26
Female	31
Total daily MP* dose (mg)	
500	15
750	1
1000	41
Duration of pulse MP* (days)	
2	13
3	31
4	13
Indications for pulse MP*	
Vasculitis	16
Respiratory failure	12
Neuropathy	6
Encephalopathy or encephalomyelitis	5
Myositis	4
Heart transplant rejection	3
Glomerulonephritis	3
Other	8

* MP: methylprednisolone

Table 1: Baseline characteristics of 57 subjects receiving pulse methylprednisolone between July 1, 2009 – 2013

• Primary Outcome (N=57)

	Pre-therapy	Post-therapy	P-value*
Serum Creatinine (SCr) (Mean ± SD) (µmol/L)	68 ± 21	68 ± 30	0.98

* P-value < 0.05 for statistical significance

Table 2: Comparison of the serum creatinine (SCr) of 57 subjects following pulse methylprednisolone therapy

Limitations

- Retrospective chart review with limited sample size
- Cannot characterize the relationship of methylprednisolone on SCr beyond the first few days after therapy: possible that there is a time delay before a change in the SCr, measurable subsequent to 2 days following the conclusion of pulse therapy
- Exclusion criteria contained a list of specific medications with the greatest potential for causing nephrotoxic effects (ACE inhibitors and ARBs not part of criteria)
- There may be other factors affecting renal function not excluded in the criteria

Conclusions

- There is **no apparent acute effect** on SCr within the 1-2 day period following administration of methylprednisolone 500-1000 mg IV daily x 2-4 consecutive days, as compared to the SCr concentration prior to drug administration
- Clinicians using supraphysiologic (or pulse) doses of methylprednisolone over such short duration do not need to be concerned with causing acute changes in renal function
- Other causes or investigations should be conducted if a patient develops any acute changes in SCr while on pulse methylprednisolone therapy, as it is unlikely that these changes are due to the drug itself

References

1. Pasrichia JS. Pulse therapy as a cure for autoimmune diseases. *Indian J Dermatol Venereol Leprol.* 2003;69(5):323-8
2. Andreev E, Koopman M, Arisz L. A rise in plasma creatinine that is not a sign of renal failure: which drugs can be responsible? *J Intern Med.* 1999;246(3):247-52