

Modified Double Filtration Plasmapheresis (mDFPP) as a Cost-Effective Alternative to Therapeutic Plasma Exchange (TPE) and DFPP in Low-Resource Settings

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INTRODUCTION

Therapeutic Plasma exchange or plasmapheresis involves separation of non cellular component from the whole blood using membrane filter or centrifugation

Double Filtration Plasmapheresis involves selective removal of certain components of the filtered plasma Like immunoglobulins or lipoproteins pioneered by Agishi *et al.* in Japan (in the 1980's)

Plasmapheresis is commonly used desensitization in transplantation and also in other non transplant situation

Double Filtration plasmapheresis involves use of second filter with specialized tubing and equipments thus increases the cost of procedures and less employed method in low resource settings in low and middle income countries.

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BACKGROUND

Non availability of Cascade filter, tubing set and specialized equipment limited the regular use of DFPP. Plasmapheresis though widely used needs multiple cycles to achieve therapeutic benefit and in Indian scenario is time consuming and expensive.

Aim Of Study

Retrospective study done to compare and analyze the cost and therapeutic benefit of mDFPP as an alternative to plasmapheresis and Double filtration Plasmapheresis in low resource setting.

Study Design: Retrospective

Objective: To compare the cost, therapeutic benefit, and feasibility of performing modified Double Filtration Plasmapheresis (mDFPP) in low-resource settings, against Plasmapheresis (PP) and standard Double Filtration Plasmapheresis (DFPP).

mDFPP Procedure:

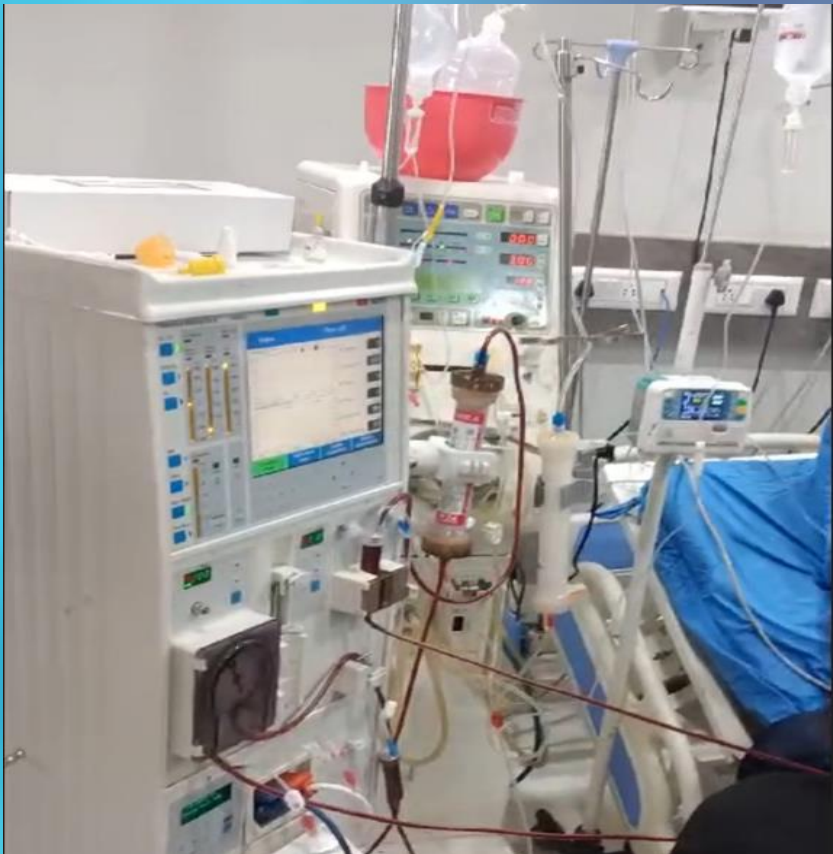
- This technique utilizes a high-flux dialyzer as the second cascade filter.
- Two dialysis machines serve as a replacement for dedicated DFPP equipment.
- Separated plasma from the initial plasmafiltration is processed through the second high-flux dialyzer.
- The resulting filtrate is then returned to the circulation using a peristaltic infusion pump set.

Endpoint: A successful plasma exchange was defined as achieving a serum IgG level at least 60% lower than the initial value for mDFPP.

Comparison will be made with those who underwent Plasmapheresis and conventional DFPP with regard to cost, complication rates, acceptability in low resource settings, ability for technicians to learn and conduct procedures .

mDFPP

- mDFPP for this study is described as use of second filter connected to the tubing outlet from plasma filtrate.
- The second filter used were high flux dialysis filters with surface area above 1.8 m²



RESULTS

Characteristic	PP	DFPP	mDFPP
N= 78	28	20	50
M:F	20:8	8:12	18:32
Indications			
Pre TX	20	12	40
Non Tx	6	-	6
Post Tx	2	8	4
Filters used			
Plasmafilter	28	20	50
Cascade flo	-	20	8
F80	-	-	20
1.9H Nipro	-	-	22
No of cycles to achieve Target	Average 4-5cycles	Average 2-3	Average 2-3
Complications	72 episodes of 140 cycles	6 episodes of 60 procedures	20 episodes of 150 procedures
Discontinuation of Procedures	20 /140 cycles	1 of 60 cycles	nil
Cost			
i. Single cycle	25-40K	60K-75 K	30K-35K
ii. Therapeutic target	1.25 Lakhs to 1.75 lakhs	1.45 Lakhs to 2 lakhs	45Kto75K
Low resource setting	Procedure can be done	Procedure cant be done	Procedure can be done
Misc advantage	Heparin free not done	Heparin free can be done using triple filter	Heparin free can be done using triple filter
Replacement fluid	Albumin FFP	Albumin FFP	Albumin FFP

Discussion

There are very limited study done on DFPP in India.

In this study mDFPP achieved results in lesser number of cycles compared to (PP 4-5 Exchanges Vs 2 Exchanges for mDFPP)

Cost of replacement fluid and material cost were 30-50% cheaper than conventional PP and 50% cheaper than DFPP filter.

Complication were less than that of PP (72 episodes in PP Vs 6 in mDFPP).

Replacement fluid requirement was less compared to PP.

Study done by C Jacob et al at CMC vellore showed DFPP effective in removing 72% of IgG and > 78% IgM and minimal side effects including hypotension and bleeding tendency. In the present study similar results were achieved

Plasmapheresis in each session had only 30% IgG removal and requires multiple sessions spanned over many days It has higher complication rates including infection, hypoalbuminemia and more expensive in terms of cost of replacement fluid requirement. Thus mDFPP was found to be more time saving and cost saving in limited resources setting

DFPP is more safer and does not require replacement expensive fluids but limited In usage for want of special second filters that is imported and not freely available at times.(Ravichandran et al 2005)

Conclusion

- mDFPP is safe, cheaper than conventional plasmapheresis and DFPP
- mDFPP is cost effective and can increase the pool for transplant even to those who cannot afford
- mDFPP is safe and complication was lower than that of plasmapheresis
- mDFPP has similar therapeutic benefit and reproducible in limited resource setting that can increase the donor pool .
- mDFPP requires lesser use of replacement fluid compared to plasmapheresis
- mDFPP can be done in any low resource setting dialysis units and does not require costly filters like eva flux or cascade flow.