

PDF Plasma Dialfiltration

Eisei Noiri, MD

- Speaker 1: [00:00](#) So now I call a third expert, professor Eisei Noiri from Japan.
- New Speaker: [00:34](#) I would like to speak about apheresis especially plasma exchange, for the treatment of sepsis. So, it is very difficult topic to deal with the plasma exchange in septic situation. But, now, recently this method called PDF, plasma diafiltration is approved.
- New Speaker: [01:22](#) PDF, this is the abbreviation of plasma diafiltration we call is currently used in Japan and maybe not familiar in this country in the United States, but people in Europe know a little bit also people from China may use it.
- New Speaker: [01:59](#) The point of today's talk is number one blood purification therapy in which simple plasma exchange is performed using a selective membrane, plasma separator, sieving coefficient for albumin is 0.3 while the dialysis flows outside the plasma separator. The PDF can remove both water soluble and albumin-bound substances and the coagulation factors are preserved because the selected membrane has sieving coefficient of zero for fibrinogen. and FXIII. So PDF is used for a patient with acute liver failure, and severe sepsis and acute pancreatitis or intoxication.
- Speaker 3: [03:16](#) So this is the core, part of this, PDF technology is that is we utilize the plasma separator called selective plasma exchange sPEX. The key to the sPEX is smaller membrane pore size is 0.01 to 0.03 microns, based on your choice. But, conventional, plasma exchange, that pore size is allowed 0.3 micron that is less than 10 times more resolution or pore size is the key point of this treatment. Therefore, the substance with molecule weight less than albumin are discarded very effectively. This is the catalog property of plasma separator called Evacureplus in Japan or in Asia and the evacloplus in Europe, this, hollow fiber is made of ethylene-vinyl- alcohol copolymer And then pore size is 0.01, 0.03, And general two choice of surface membrane and then sterilization is gamma irradiation.
- Speaker 3: [04:54](#) So Sieving coefficient of EC-2A , it's shown here. So I do see here FXIII the factor of fibrinogen, it's almost close to zero. And if maybe in case of a septic patient you do like to save you would like to keep the patient IgG. So this can be also clearly preserved for your patient and albumin, this resolution just started 2

percent So therefore, just this part should be supplied to the patient during the treatment, but, instead of this part or here as you see here, the IL-6, TNF-a and IL-8 also FLC is effectively removed in this treatment. So therefore this type of membrane is very effective to remove cytokines storms in during these septic situations.

Speaker 3: [06:16](#) Here it's a scheme of molecular shape of albumin and albumin is very important molecule that can bind to the toxic substances related to lipid peroxidation product and also as S-Nitrosothiols. And also this can be utilized for the physiological situation for the **cardio** middle and short- chain fatty acid. And also in septic situation. Bilirubin acid, these are tvery much, conspicuous and enormous, I think you will be interested in this kind of molecule for the Marco liver dysfunction, et cetera. And also combined to this, kind of metal ions and also albumin can carry these kind of pharmaceuticals including the diazepam and also **tylophorine** et cetera

Speaker 3: [07:34](#) So here is a chart of toxin. So toxin can be divided to two kind of properties like water soluble or water insoluble. So water soluble can be removed by dialysis **extra proponere** support as well as mentioned by **Dr. Ronco** and **Dr Kern** and albumin dialysis. This can be used for this non water soluble materials. But these 2 toxins can be treated with this PDF simultaneously. This is a very strong point and the MARS is also very effective method to do foc**using to** this albumin diarlysis but unfortunately we do not have, our insurance system is not approved to use MARS yet we have a very much interest in doing but we cannot. So therefore, we are trying to use PDF for the treatment this kind of water soluble and water insoluble toxins.

Speaker 3: [08:55](#) But here is a diagram of a PDF. what are we using, we are using EC-2A for 8 hours or 3 consecutive times. this is regular, prescription and this method PDF plasma diafiltration **verse**, the reimbursed to acute hepatic failure, unrelated septic condition in Japan, very recently. And this is regular circuit for CRRTand also or plasma exchange. And then this part from this point, the plasma is extracted and discarded and dialysate underthe placement fluid called **saburat**. This is a commercially, unbearable in Japan are used from lifting hundred mil per hours of dialysate and then , 600 mill per hours for replacement, in addition to this PDF.

Speaker 3: [10:15](#) We are adding one more **route** here that is a mixture of FFP usually uses 1825% albumin 50 mil and the speed is 230 **minutes**, mill per hours. So then we are using the regular

console CRRT but this part you needed to add extra pump this is an image this machine is made by Toray I guess. And this is a regular CRRT machine, you do not need nothing for the special machines for this PDF, but you need one additional fluid pump as I mentioned, for FFP and the albumin and additional line was joined here. And this is bed side console for RRT. And this is coverage of molecular weight using this PDF, here is the cytokine. Here is a resolution point of this, method. As I mentioned, this PDF can preserve isotypes of immunoglobulins and also part of albumin, the clearance of PDF is, creatinine so far that is 20 ml/min, total bilirubin is 5.6 ml/min and cytokines are 18 ml/min and cytokines sieving coefficient is 0.8 to 0.9. As I demonstrated in the previous slides. So applicability of PDF to acute liver failure and a fulminant hepatitis and severe sepsis and sepsis with MOF. Now sepsis with liver dysfunction is the kind of hallmark of severe sepsis and the poor prognosis. Therefore, PDF is the first indication in depending on the Institute. And the sepsis to the acute pancreatitis and similar acute pancreatitis is also the indication application indication or PDF.

Speaker 3: [13:00](#)

And also acute intoxication is also the indication. And instead theophylline and carbamazepine and phenobarbital and digoxin paracott, et cetera, these are used for this kind of intoxication. And here is an example of how this PDF will work for, subacute liver failure. Now, 75 years old male here, what's shown here? So please pay attention to this magenta line and then this thick line here and here this is before the PDF and after the PDF. This is, magenta is totally a bilirubin so. You see here, the here to here, here to here, here to here and here to here. So with this method. clearly this albumin can reduce to a certain amount for the patient. if the albumin surges higher, this gap is at the top is enormous. It's smaller, it's going to be much less. So the reduction rate is summarized here. So before, after, so that is 26% to this reduction and within this that the total is bilirubin is 32.2%.

Speaker 3: [14:33](#)

although the cases very small number. The comparison of albumin volume. In this slide I compared the amount of albumin necessary for 2 methods PEX and the PDF was calculated here these patient's serum albumin, is 3 gram/dl and the hematocrit is 30% and 176 pounds Then maybe you will multiply this, 80 kilograms to 0.07 will be your, blood volume and then multiply. This low mark 0.3 .07 Here, then it will be 5.6 liter FFP for 1.4PV understand. So I should I tell it again

Speaker 3: [15:40](#)

80 kilogram multiply 0.07 we'll give you the blood volume and then multiply 0.7 that will be your plasma volume. Then multiply 1.4 will be this. Okay. That is a calculation for this kind

of prescription. Then approximately 224 grams of albumin will be used in and then, but in case of PDF, so 25% of albumin 50ml and FFP 1800 would be often used. So this albumin, this mixed solution, we'll give it to you. the albumin volume of 85 gram. Therefore compared to with this and this around maybe 40% amount is necessary for PDF. Therefore you can save, the albumin with treatment In summary, number one core concept or PDF is the combination of selective plasma exchange and dialysis this, the PDF can handle both water soluble and insoluble, toxins without specific console. Using PDF The volume of FFP can be reduced, around 40%, compared with PEx. regular plasma exchange., And then PDF is suitable to acute liver failures, severe sepsis, sepsis in multiple organ failure and acute pancreatitis and intoxication. And, currently, I think it was, reimbursed in Japan in 2016, so very recently. Thank you very much.