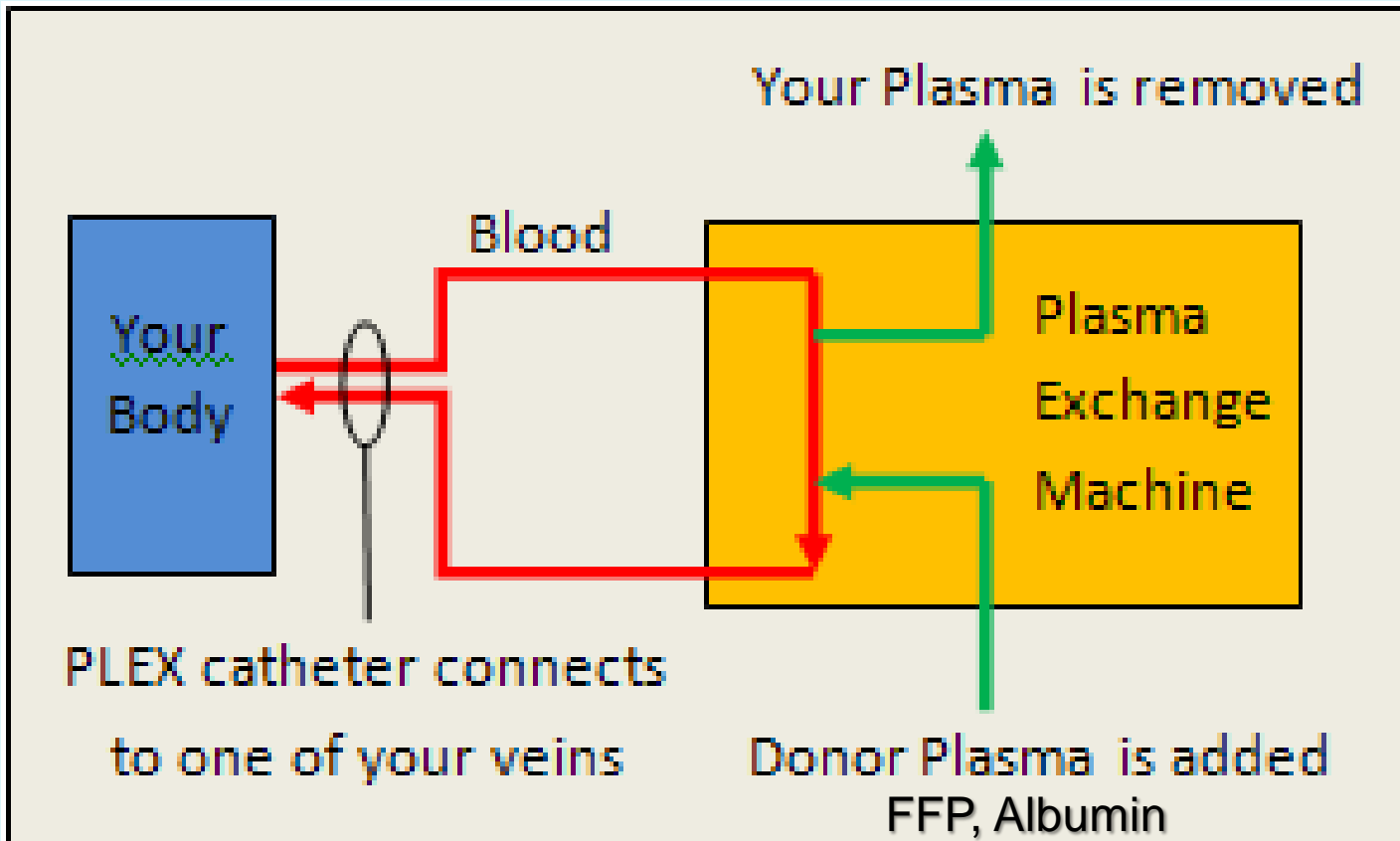


# Therapeutic plasma exchange in severe thyrotoxic states



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# Principle of therapeutic plasma exchange (TPE)



# Substances removed by TPE



- Protein-bound substances
- Auto-antibodies
- Immune complexes
- Abnormal blood cells
- Lipoproteins

# How does TPE reduce thyroid hormones?



- Removes TBG.

80% of thyroid hormones are bound to thyroid binding globulin (TBG).

- Redistribution or dilution of thyroid hormones from intracellular into replacement solution.
- New binding sites for free hormones.
- Removes 5' monodeiodenase.

# Indications for TPE



## Thyroid storm

- **Indication Category III:** optimal role not established; individualize treatment
- **Recommendation grade 2C:** weak recommendation
- **Type of evidence II-3:** case reports / series

# Indications for TPE in severe thyrotoxic states



- Failure of conventional treatment.
- Contraindications to other therapies.
- Rapid clinical deterioration.
- Stabilize patient before surgery.
- Thyroid storm: cardiac, neurologic symptoms.

# Technical note



- Volume replacement: 1 to 1.5 x TPV, 40-50 ml/kg
- Frequency: daily or every 2 to 3 days

Thyroid hormone levels usually rise again the next day after TPE.

- Continued until clinical improvement is noted.

Some cases: FT3, FT4 unchanged / increased  
(displacement of thyroid hormones from intracellular compartment)

**Improvement: T3, T4, patient's condition.**

# Technical note



Replacement solution	Albumin	FFP
<b>Pros</b>	No viral transmission Minimal anaphylactoid reaction	Better efficiency? (Thyroid hormones bind tightly to TBG in FFP) Less costly
<b>Cons</b>	Depletion of coagulation fx immunoglobulins	Viral transmission Hypocalcemia Severe anaphylactoid reaction
<b>Clinical use</b>	Most conditions	Indicated for TTP TTP/HUS, TMA



# Efficiency of TPE



- Plasma volume

Amount of T<sub>4</sub>, FT<sub>4</sub>, FT<sub>3</sub> extracted was highly dependent on the exchanged volume ( $p < 0.001$ ).

- Replacement soln: FFP vs Albumin

TBG (found in FFP) binds 80% of circulating hormones.  
Albumin binds 10% of T<sub>4</sub> and 20% of T<sub>3</sub>.

- Initial hormone concentrations

More efficient if done early.

**Schlienger et al (1985).** Presse Med 14(23):1271-4  
**Puy et al (1992).** Biomed Pharmacother ;46:413-17  
**Schlienger (1992).** Horm Metab Res;24:46-7

# Complications of TPE



- Hypotension
- Citrate-induced hypocalcemia (tetany, seizure) (FFP)
- Viral transmission (FFP)
- Anaphylactic reactions (FFP)
- Coagulation abnormalities (Albumin)
- Problems with vascular catheters
- Transfusion-related acute lung injury

# Major case series of TPE

Case series	Indication	No. TPE	Total vol replace per patient	Response % decrease
<b>Schlienger</b> 1992 11 cases	Thyroid storm	2.9	1 x TPV Albumin	T3 47% T4 39% FT3 unchanged FT4 6%
<b>Ozbey</b> 2004 4 cases	Prepare for Thyroidectomy	3	1-1.5 L per exchange Alb or FFP	T3 65% FT4 75%
<b>Ezer</b> 2009 11 cases	Prepare for Thyroidectomy	3	1-1.5 L per exchange Alb or FFP	FT3 76% FT4 44%
<b>Muller</b> 2011 3 cases	Thyroid storm	3.3	No data	FT3 26% FT4 55%

# TPE @ Siriraj July 2012 – Feb 2013

Case	Indication	No. TPE	Total vol	Response % decrease	Complications
1	Thyroid storm	1	Alb 2L FFP 0.5L	T3 29% T4 26% FT3 34%	Hypotension
2	PTU - induced pancytopenia Prepare I131 ablation	2	Alb 4.5L FFP 1.5L	T3 48% T4 64%	None
3	Drug hypersensitivity to PTU Prepare thyroidectomy	3	Alb 5L FFP 2L	T3 23% T4 50% FT4 26%	None
4	PTU-induced agranulocytosis Prepare thyroidectomy	1	Alb 3L	FT4 20%	Coagulopathy
	<b>Summary TPE @ Siriraj 4 cases</b>	<b>2</b>	<b>4.6L</b>	<b>T3 33% T4 47% FT4 23%</b>	

# Thyroid disorders in elderly patients



- Symptoms are often subtle or absent.
- Diagnosis often overlooked or misdiagnosed.
- Confused with coexisting illnesses or mistaken as age-related changes.

# Hyperthyroidism in elderly patients



- Prospective cohort study. 34 older patients (**> or = 70 years; mean age 80.2**) and 50 younger patients (< or = 50 years; mean age 37.4).
- Found in > 50% of older patients: **tachycardia, fatigue, and weight loss.**
- More frequently in older people: **anorexia** (32% vs 4%) and **atrial fibrillation** (35% vs 2%) (P < .001).

# Hyperthyroidism in elderly patients



- **Goiter: 50% of older patients vs. 94% of younger ( $P < .001$ ).**
- **Less frequently in older patients ( $P < .001$ ):** heat intolerance, tremor, and increased appetite.
- **Apathetic thyrotoxicosis.**

# Neuropsychiatric manifestations in hyperthyroidism



- Restlessness, irritability, insomnia, and emotional lability.
- **Behavioral and personality changes:** confusion, agitation, psychosis and depression.
- **Cognitive impairments:** impaired concentration and memory.