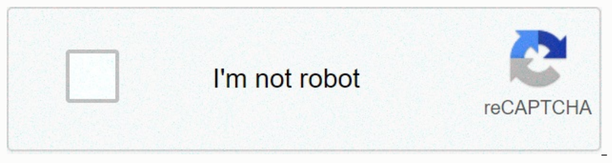

Continue

Spectra optia apheresis system manual

VASCULAR ACCESS COMPLICATIONS9 Pages 1 2 3 4 Content table 5 6 7 8 9 10 11 12 13 14 15 16 17 18 1 9 20 21 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 3 7 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 63 64 65 66 66 67 68 68 69 67 68 69 67 68 69 67 68 6 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 866 866 866 86 7 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 Anne Klink, Silke Rummler Department of Therapeutic Apheresis, Institute of Transfusion Medicine, University Hospital of Jena, Jena, Germany Summary: The Spectra Optia® Apheresis System is an automatic separator of blood components used to perform various therapeutic procedures of ahesia , cell collection and treatment procedures. Users can follow all the instructions given by the secure and comfortable OPS. However, there are no official guidelines for the use of specific devices of ahesia in therapeutic ahesia. The purpose of this review is the application of this system of ahesia in therapeutic ahesia, and its clinical risks and benefits. Although there is little data evaluating the use of the Spectra Optia Apheresis system, it can be said that the Spectra Optia device is safe to use and comfortable for both patients and operators. Therapeutic procedures such as plasma therapeutic exchange, procedures with secondary plasma features, as well as blood cell depletion procedures can be performed effectively and accurately using this device. Serious side effects have not been reported. All published data showed clinical benefits, which were more pronounced than clinical risk. The only drawback of the system is the use of citrate, especially in plasma-based procedures, as its optimal use has not been evaluated. For further evaluation of the Spectra Optia Apheresis system, more data on clinical outcomes is needed. Keywords: Spectra Optia®, therapeutic ahésia, plasma exchange, secondary plasma device, blood cell depletion, red blood cell exchange, mononuclear cell collection Introduction Spectra Optia® (SPO, Terumo BCT, Lakewood, CO, USA), a new refined aphesy system that has replaced spectra Cobe (Cobe; Terumo BCT, Lakewood, CO, Usa), is based on established trima and cobe technologies. OPH is now widely used in routine clinical practice as it allows operators to perform a variety of procedures such as plasma-based treatments and cell-based therapeutic ahesia. For this examination, relevant procedures such as plasma therapeutic exchange (TPE), lipoprotein aphesia immunoadsorption (AI), white blood cell depletion (WBC) or platelets, and unsimulated collection of mononuclear cells are listed in Table 1. Table 1 Overview of Cell Exchange, Depletion and Collection Procedures for Cell Immunotherapy Note: The table describes the average therapeutic efficacy and the most important indications for the guidelines5 Abbreviations: AB0, incompatible; AB0i, blood type; AMR, high-profile antibody rejection; ANCA, antineutrophile cytoplasmic antibody; ASFA, American Society for Apheresis; CE, efficiency of collection; CIDP, chronic inflammatory polymyelination of polyradiculoneuropathy; DDI, infusion of donor lymphocytes; ECP, extracorporeal chemo phototherapy; FSGS, focal segmental glomerulosclerosis; LA, lipoprotein apheresis; LD, living donor; Lp(a), lipoprotein (a); PRE, plasma removal efficiency; TTP, thrombocytopenic thrombotic purpura. However, it remains to be assessed whether all procedures can be performed effectively and safely. As a result, we reviewed recent literature from different databases (PubMed, Medline and Cochrane Database). With the exception of those who reported on therapeutic ahesia in children, all publications on therapeutic procedures of ahesia were analyzed with respect to their efficacy, clinical risk, and benefits. TPE plasma therapeutic exchange is used to remove or decrease the level of circulating antibodies, immune complexes, cytokines, abnormal plasma proteins, cholesterol, waste metabolic products, and plasma-related toxins and drugs.1-4 Randomized controlled trials have demonstrated the efficacy of TPE in the treatment of various diseases, including purpura thromboticcy thromboetopnic (TTP) , acute inflammatory demyelinating polyradiculoneuropathy, myasthenia gravis, and central nervous system demyelination. TPE is also used to treat many other disorders, although there is a lack of sufficient randomized controlled trials in this regard. More than 100 clinical syndromes and 65 diseases are included in the Guidelines of the American Society for Apheresis (ASFA).5,6 TPE can be performed using centrifugation (CTPE) or filtration (mTPE) devices. Physicians in transfusion medicine prefer CTPE, while nephrologists usually use mTPE. Compared to cTPE procedures, the mTPE procedure requires high flows to achieve transmembrane pressure, needs a larger vein, and has a lower extraction efficiency of 27%-53% (compared to 86% in cTPE).7-9 In addition, mTPE procedures are less effective for higher-molecular weight proteins such as IgM, fibrinogen, and immune complexes.3,8 In recent PubMed research , we found 12 reports on cTPE using SPO.8-19 In these publications, different data were analyzed. The most important data, such as the effectiveness of plasma elimination and the use of citrate, are listed in Table 2. Table 2 Summary of published data on EPTs on efficacy with the OPH Aphesia Device Notes: PRE is plasma volume that can be removed by plasma volume that is treated with a specific aphesy device; based on the treated plasma volume of 30 mL/min (26.25-32.50 mL/min); calculated based on total blood volume -70ml/kg of body weight for male patients and 65mL for patients. Abbreviations: TBV, total blood volume; TPE, therapeutic plasma exchange; PRE, plasma removal efficiency; OPS, Spectra Optia®; ACD-A, ACD-A, citrate A dextrose solution. Because of the high fraction of the plasma removed, it is possible to use a dual peripheral venous access and, if necessary, a single needle method. Peripheral venous access has been used in the range of 30% to 60% by operators.8,11,12 During TPE, no serious adverse events (AE) have been reported.8 TPE procedures are safe and well tolerated, with AEs occurring in 5%-7% of cases. These EAs usually include reactions to replacement fluid or citrate and hypotension. Three vasovagal events are mentioned.14,15 Various amounts of anticoagulant acid citrate dextrose solution (ACD-A), 5.7%-31.3% of total consumption, or 1.7% ± 0.7% of the blood input volume were returned to the patient during TPE procedures.10.13 therefore, with the prophylactic use of 10% calcium gluconate, only signs of mild symptomatic hypocalcemia were observed with the same 1.2% prevalence as analyzed in a previous study.7 Using a low ACD-A infusion rate of 0.8 mL ACD-A/min/L total blood volume, the estimated decline in ionized calcium would not exceed 10%-15%.20 In some cases, patients cannot tolerate ACD-A; here, ACD-A can be saved by adding heparin. In the section of plasma therapeutic ahesia with secondary plasma device (SPD), 2 diets are demonstrated.21,22 It should be noted that platelet loss in plasma exchange treatments with OPH is not consistently presented in the literature. Kes et al. described a relatively high platelet loss (Table 2) when using a high input flow greater than 80 mL/min.8 The results of Tormey et al. indicate that platelet loss may be as low as 1% with moderate input rates of about 54 mL/min.14 In particular, OPH plasma exchange could reduce the risk of significant platelet loss in patients suffering from TTP clotting or bleeding events.19 In the treatment of OPH are not found in the literature. Unlike mTPE, these procedures are associated with AE, particularly clotting and filter replacement, in up to 25% of all procedures.17 Regarding clinical outcomes, and IgG reduction of EPT treatment using OPH, only 4 reports were available.8,9,16,17 Hafer et al. showed the reduction in average IgG from 5.88 g/L (3.42-8.84 g/L) to 1.89 g/L (1.2 1-3.52g/L) in exchange Using patient plasma volume 1.2 times in a TPE.9 procedure in TPE, it is difficult to calculate IgG removal efficiency using fresh frozen plasma as a replacement fluid. When albumin was the replacement fluid of choice, IgG removal efficiency was 72%.8 a patient, with atopic dermatitis. has been successfully treated. The average reduction rate of immunoglobulin E was 29%.16 TPE performed with SPO due to severe hypertriglycemic rapidly reduced serum triglyceride level.18 Autoantibodies-related to increasing glomerulonephritis and small vessel vascularitis were effectively removed.17 Our own data showed that 9 out of 102 TPE procedures ended prematurely due to technical and AE problems. From the Cases, 4 cases were due to venous problems, 2 were due to hypotension, and 1 case each was due to vomiting, hypertension, and citrate reaction. Light self-limitation or AE with minor corrective activities occurred in 17% of cases. Plasma therapeutic ahesia with spd specific plasma purification methods such as lipoprotein apheresis (LA) or immunoadsorption (AI) have been developed for selective removal of alleged pathological substances. If TPE fails, AI may be an alternative in patients with life-threatening autoimmune diseases or during acute episodes of humorous graft rejection.38,39 Because of the superior efficacy of other selective removal systems in cholesterol removal, TPE is less commonly used. Referring to asFA's current guidelines for 20165, 5 indications for procedures with spd are listed in Table 1. In a recent PubMed research, only 2 reports regarding SPD were found.21.22 Handschel et al. described a new protocol for LA with SPO.21 for LA, the authors used dextran sulphate-adsorption cellulose (Kaneka, Osaka, Japan) or AI method (Pocard, Moscow, Russia) in combination with ADAsorb® devices (Medicap, Ulrichstein, Germany). A total of 9 patients were treated with familial hypercholesterolemia. A modified anticoagulation regimen with addnable use of heparin in LA was used. In a follow-up, the authors analyzed 20 additional procedures with optimized whole blood: 20:1 ACD-A ratio if 10,000 HEparin OF EI was in the ACD-A bag and achieved a total cholesterol reduction of 59% ± 7%. With this diet, 2 episodes of puffy mantle agglutination or granularity in the connector were recorded. AE as citrate toxicity was rare because of prophylactic intravenous calcium infusion of 0.026 mmol/min.26 Rummler et al. used pore size filter technology with Monet® (Fresenius medical care, Homburg, Germany) or EvafluxTM (Kawasumi, Tokyo, Japan) for Los Angeles and adsorption matrix sepharose with the coating staphylococcal protein A, Immunosorba® (Fresenius Medical Care), for IA.22 They also worked with the ADAsorb® (Medicap) device. The anticoagulation regimen in Los Angeles was performed with ACD-A alone (whole blood report: ACD-A, 12:1). In iA, the ACD-A ratio was 15:1, and 1,000 IE/h heparin was further administered. Therefore, the use of citrate was 0.17 mL/mL plasma treated in LA and 0.14 mL/mL plasma treated in AI. The authors analyzed 73 LA in 4 patients. On average, LDL cholesterol was reduced by 57% (37% to 64%) and lipoprotein levels (a) were significantly reduced by 68% (45%-76%) In 1 session in Los Angeles. A LOS has proven to be safe and effective. No cardiac events or rejection episodes were observed. Nine critically ill patients with different indications for AI (e.g., positive neurological antibody diseases, acute humorous rejection after heart transplantation or kidney transplantation, idiopathic dilated cardiomyopathy and connective tissue disease) received a total of 76 CEW treatments. The amount of IgG circulation has been reduced an average initial value of 6.6 g/L (1.09-21.0 g/L) to 2.61 g/L (0.33-14.7 g/L). A total of 97% of all treatments for SPD were carried out as planned. The reasons for premature completion of procedures were AE such as breast pain, severe hypotension and venous access problems; the latter AE was rare in the occurrence. The toxicity of citrate has not been observed. The dosage of intravenous calcium prophylactic gluconate administered was 0.029 mmol/min (0-0.047 mmol/min) in LA and 0.033 mmol/min (0.033 mmol/min) 0-0.052 mmol/min) in red blood cell exchange (RBCX) and/or rbc depletion (RBCD) RBCX and/or RBCD may be performed within 1 procedure. In the first stage, the erythrocytes can be depleted isovolemically, and in the second stage, the erythrocytes can be exchanged. Both procedures can be chosen to operate independently. The RBCX was created to perform rbcx in sickle cell disease (Table 1). To this end, studies have been conducted that have examined the efficacy and safety

of the procedure. The equivalence of technical performance with hemoglobin S (HbS) parameters after treatment, fraction of remaining cells (FCR), procedure duration, processed volumes of blood and anticoagulant and consumption of RBC units were confirmed.23-26 The RBCD/RBCX protocol in SPO and the hemodlution/RBCX isovolemic protocol in Cobe are comparable.23,24 No significant differences were found in HbS, hematocrit, FCR, and number of platelets. Interestingly, rbcd made with SPO requires a significantly lower saline replacement volume and rinse volumes (P-lt;0.001). However, a longer process time should be noted in the OPS.24 An effective reduction in HbS was confirmed by Daniel et al. in a simple exchange of erythrocytes, initial HbS levels were reduced from 73%-85% to 22%-29%.25 The main objective in RBCX SPO was to confirm that the patient's expected RCF at the end of the procedure reflects the actual FCR, measured in HbS%. The average expected RATIO of FCR/FCRp was 0.90 (95% CI, 0.86 to 0.94) within the pre-defined acceptable range of 0.75 to 1.25. The safety profile of RBCD/RBCX in 60 patients examined by Quirolo et al. remained effective without severe AE and unexpected adverse side effects.26 However, hypotension in RBCD/RBCX procedures with SPO occurred more often in 7% of cases compared to 1.8% in Cobe. Erythrocyte depletion is mentioned as a method of removing iron in patients with hereditary hemochromatosis. To this end, a small study was published where an average blood volume of 857.3 ± 22.3 mL with a short average treatment period of 12.0 ± 0.4 min was treated, and the average hematocrite per session was lowered by 6%. Iron of 405.2 ± 23.2 mg per procedure was removed.27 Collection of mononuclear cells (MNC) For collection MNC, 2 different options are available. The MNC procedure performs successively several phases of accumulation and collection. Here, a high centrifugal force is exerted to achieve an optimal packaging factor (default is 20) for anticoagulated anticoagulated anticoagulated to enter the separation channel. The Automatic Interface Management System (AIM) regulates the flow of the plasma pump to control the concentration of cells circulating through the collection port. The collection pump transfers the MNC and platelets from the regulatory chamber to the second chamber where the platelets are selectively removed by elitration and returned to the patient. The optimal positioning of the interface should be defined via the collection preference based on the desired target performance of the product cells and the content of the erythrocytes.30,34 The second option is the continuous MNC procedure (CMNC) in which the patient's blood is pumped into the tube set and the centrifuge rotates to reach the default packing factor of 4.5 on a slightly larger volume separation channel with a less interface layer. Minor. The AIM system regulates the flow of the plasma pump to control the concentration of cells passing through the collection port, depending on the collection preference. If the cells are detected by the AIM system, the valve of the collection pipe moves to the collection position, and the collection pump pushes the MNC into the collection bag. The platelets are suspended in the plasma layer and are returned directly to the patient without the need for a secondary separation chamber.34 The indications for MNC and cmnc procedures are identical in principle. Examples of clinical application are the offline method of extracorporeal photophenesis (ECP), collection of autologous peripheral blood stem cells, and other new immunotherapies such as immature dendritic cell treatment or chimeric antigen receptor-modified cell therapy. Two of the most common indications are apheresis of allogeneic peripheral blood stem cells and donor lymphocytes, which will not be discussed further here. All of these approaches require reliable MNC collection with a defined cell population composition. In the database analysis with PubMed and Medline, MNCs were identified for apheresis with OPS in 28 studies between June 2011 and December 2017. ECP extracorporeal photophesis is an established cell therapy for the treatment of T lymphoma skin lymphoma, graft against host disease, and organ rejection after organ transplantation.28 Several studies have been performed on MNCs apheresis comparing the efficacy of OPS with its precursor cobe and other ahesia features (Table 3). These showed the collection of high quality MNC with low platelet and erythrocyte contamination.29-31 In non-simulated collection procedures for secondary treatment of patient safety, including a short collection time and a small volume of product, is patients received a series of procedures. With regard to secondary treatment, the product hematocscribed is more critical because the MNC cell count.30 Unfortunately, the prediction of the number of MNC cells is difficult due to each patient's own peculiarity. Del Fante et al.'s study showed that the use of the MNC SPO procedure may an average product volume 10% lower with possible benefit for subsequent irradiation and lower liquid load with low body weight.29 Table 3 MNC collection in non-simulated patients for secondary treatment to perform offline ECP or for donor lymphocyte infusion Notes: amixed anticoagulation with 5 Heparin IU/mL ACD-A; bCE for lymphocytes (CE- is based on the average number of target cells before and afteraphed); cCE for MNC. Abbreviations: ACD-A, anticoagulant solution citrate dextrose A; CE, Collection Efficiency; CMNC, a continuous collection of mononuclear cells; DDI, infusion of donor lymphocytes; ECP, extracorporeal photophesia; MNC, mononuclear cells; Untested; OPS, Spectra Optia®; TPE, therapeutic plasma exchange. An interesting strategy to reduce ACD consumption is the initial 1:12 to 1:20 increase in MNC procedures described by Del Fante et al The operator has modulated the ACD-A ratio based on the number of platelets, Clotting status, and comorbidities.29 An anticoagulation proportion sufficient to maintain adhesion platelet function is essential if differentiation of dendritic cells in ECP occurs by transient engagement of monocytes with device-joining activated platelets and their ligands.32 To what extent the anticoagulation regimen in ECP may influence the clinical outcome is unknown. For ecp, no WBC threshold is set. Nevertheless, up to 1.0×1010 total lymphocytes with high purity seem possible to be collected within a procedure.29,30,33,34 The importance of product purity is described only for patients with an indication for ECP due to lung involvement after lung involvement after transplantation.29 Punzel et al. compared the MNC procedure with the CMNC procedure in the context of collecting lymphocytes for donor lymphocyte infusion.34 It has been observed that the CMNC procedure takes a shorter treatment time and a lower product volume but a higher number of hematocrite and platelet in the product. With lower centrifugal forces using a packing factor of 4.0 instead of 4.5 in cmnc, it is possible to reduce platelet contamination in the cell product while keeping all target cells at the same yield.34 Nevertheless, we do not prefer the use of the CMNC procedure in the offline ECP setting because a significantly higher hematocscribed in the product may hinder subsequent treatment with UVA illumination. CMNC with small product volume, shorter procedure time, and thrombocyte savings may be the preferred setting for the collection of peripheral blood stem cells. Brosig et al. have made an important contribution to their analysis of ECP methods in offline33. Side effects were not observed in the ECP methods tested. For offline methods, calcium was substituted as needed by anticoagulant with ACD-A, effectively preventing the most common side effect.33 The report on the preparation of mini buffy buffy for adult patients who can't receive an online ECP or an offline ECP seems interesting. Whole blood separation with bone marrow treatment program of the OPS ahesia system in 1 group achieved a higher lymphocyte yield than the standard mini buffy coat preparation method with the fully automated Compomat G4 separator device. This technique, which has been examined in healthy whole blood donors, should be further studied in a clinical setting.27 With regard to AEs, only mild hypocalcemia in the MNC collection for ECP has been reported. The occurrence of mild hypocalcemia has been reported by study groups of Del Fante et al. and Schulz and others29,30 white blood cell depletion (WBCD) and platelet depletion (PLTD) For WBCs depletion, different procedures performing with SPO are available. It is possible to use the granulocyte collection procedure (PMN) as well as the WBCD procedure. There are no substantial differences between the two methods; only the default settings are different. The set to be used is the SPO (IDL-Set) intermediate density layer. This set is particularly developed to collect a large amount of CWB or platelets in a short period of time. Clinical manifestation of leukostasis due to hyperleukocytosis in acute lymphoblastic (ALL) or acute myeloid (LAM) procedures could motivate physicians to perform leukocytapheresis procedures. The depletion of the WBC in the symptomatic ALE with wbc counts -100×109/L or ALL with wbc count -400×109/L is recommended with respect to ASFA guidelines as category II grade 1b.5 In a PubMed research, we found only 3 reports related to WBCD or PLTD with SPO.30,35,36 WBCD performance with SPO was first described by Schulz and others.30 They treated 5 patients with leukostase due to AML and performed a total of 8 PMN treatments. Double the total volume of blood, a product equivalent to one-fifth of the total blood volume or no more than 300 minutes, were treated. ACD-A was used for anticoagulation in a 12:1 report (whole blood: ACD-A). Depending on the clinical situation, the report has been adapted. It is important to note that, under normal operating conditions, the extracorporeal volume of the IDL-Set does not exceed 253 mL. Under alarm conditions, extracorporeal volume can increase to 297 mL. Therefore, it is simple to overcome the permitted extracorporeal volume limit. However, in addition to mild hypocalcemia, no AE, including hypotonia, was observed.30,36 A collection efficiency of 47.3% ± 7.4% and platelet attrition of 32.8% ± 2.8% was achieved, but the authors admitted that a very variable number (up to 50% of cells was mobilized into the bloodstream during leukocytapheresis. Despite a low decrease in WBC count (22%), Cline et al. described a high volume of collected cells, 3.51x1010 WBC per volume of treated blood using the PMN procedure.36 In the transfusion medicine aphesia unit at Jena University Hospital, we treated 7 patients with hyperleukocytosis; AML and 1 case was with ALL. We used the WBCD procedure exclusively. The number of WBCs was reduced by an average of 27% (5% to 55%) relative to the baseline. All wbcd procedures were completed as planned. Despite a high extracorporeal volume at the end of the WBCD, there was no EA. Only 1 case of PLTD in a pregnant woman at 35 weeks gestation was reported.35 thrombocytapheresis procedures were performed within 2 weeks. An average of 1.3 ± 0.3 total blood volume was treated, and collection efficiency was 50.6% ± 2.6% while preserving the level of leukocytes. No AE and no other pregnancy complications have been documented. Conclusion There is little data available on the clinical risks and benefits of OPH ahesia treatments. All published data showed clinical benefits, which were more pronounced than clinical risks. The OPS works efficiently and achieves high plasma extraction rates, even with a low input rate. TPE procedures are safe and well tolerated, with AEs occurring in 5%-7% of cases.14,15 AEs generally include reactions to replacement fluid, citrate, and hypotension. Platelet loss using moderate rates of input flow is no longer a clinical risk, even in patients with TTP. Evaluation of published clinical results results were adduced in effective removal of pathological substances like IgG-autoantibodies, and triglycerides. SPO SPD-LA treatments achieved an effective removal of lipoproteins such as LDL cholesterol and lipoprotein up to 59% and 64%, respectively, compared to baseline.21,22 In particular, no cardiac events were observed. In SPO SPD-IA, there is almost no published clinical data on the results. However, the described reduction in IgG appears satisfactory. To date, in plasma-based procedures, the optimal use of citrate has not been evaluated. The use of ACD-A in TPE differs between aphesia centres from 3.11 mL/min to 6.61 mL/min. Nevertheless, bleeding or clotting has not been observed.8-14,17 PLTD, PMN, and WBCD procedures are suitable for rapid blood cell depletion. Assessing the effectiveness of collection is difficult, due to the mobilization of CWB in the bloodstream in WBCD or PMN procedures. In addition, these procedures often exceed the permitted extracorporeal volume limit. Nevertheless, no severe AE was observed.30,36 Described PLTD procedures could reduce platelet in a pregnant woman with thrombocythemia without AEs.35 RBCD/RBCX protocols in SPO are comparable to the RBCX hemoddilation isovolemic protocol in Cobe Spectra.23 No significant difference was found. SPO-MNC procedures unsimulated patients showed high quality MNC collection with low platelet and erythrocyte contamination, and 10% lower product volume with possible benefit for subsequent illumination in ECP. Unfortunately, the efficiency values of the collection are not comparable. Aphesia centres used different calculation formulas.29,30,33,34 In cell-based OPS procedures, cell-based anticoagulation differs slightly between aphesia centres. Sweet AEs are reported. In general, for further evaluation of the OSS, more data on clinical outcomes is needed. Acknowledgements The authors thank Tom Westhaeuser for the excellent support in the arrangement of this review. Disclosure Silke Rummler works as a country reviewer for Terumo BCT, Inc. The authors do not report any other conflicts of interest in this work. References 1.Bramlage CP, Schroeder K, Bramlage P, et al. Predictors of complications in therapeutic plasma exchange. J Clin Apher. 2009;24(6):225–231. 2.Sanchez M, Guadilla J, Fiz N, Andia I. Plasma injections rich in ultrasound-guided platelets for the treatment of osteoarthritis of the hip. Rheumatology. 2012;51(1):144–150. 3.Pusey CD, Levy JB. Plasmaphesia in immunological kidney disease. Blood purif. 2012;33(1-3):190–198. 4.Paton E, Baldwin IC. Plasma exchange in the intensive care unit: 10-year retrospective audit. Aust Crit Care. 2014;27(3):139–144. 5.Schwartz J, Padmanabhan A, Aqui N, et al. Guidelines on the use of therapeutic aphesia in the evidence-based clinical approach of the American Society for Apheresis: The Seventh Special Issue Editorial Board. J Clin Apher. 2016;31(3):149–338. 6.Reeves HM, JL Winters. The mechanisms of action of plasma exchange. Brother J Haematol. 2014;164(3):342–351. 7.Linenberger ML, TH Price. Use of cellular and plasma ahemia in critically ill patients: part 1: technical and physiological considerations. J Intensive Care Med. 2005;20(1):18-27. 8.Kes P, Janssens ME, Ba'i-Juki-N, Kljak M. A randomized crossover study comparing therapeutic procedures for the exchange of membrane plasma and centrifuges. Transfusion. 2016;56(12):3065–3072. 9.Hafer C, Golla P, Gericke M, et al. Therapeutic exchange of plasma membrane for centrifuge: a randomized prospective crossover study. Int Urol Nephrol. 2016;48(1):133–138. 10.Kim DK, Kim S, Jeong SH, Kim HO, Kim HJ. Therapeutic plasma exchange using the Spectra Optia cell separator versus Spectra COBE. Ann Lab Med. 2015;35(5):506-509. 11.Cid J, Molina JM, Mustieles MJ, Peri-ez M, Lozano M. Comparison of plasma exchange procedures using three ahesia systems. Transfusion. 2015;55(5):1001–1007. 12.Hequet O, Stocco V, Assari S, et al. Comparison of plasma exchange performance between Optia spectra and COBE spectra aphesia systems in repeated variability-based procedures using specific statistical models. Apher Sci Transfus. 2014;51(1):47-53. 13.Lambert C, Gericke M, Smith R, Hermans C. Plasma collection extraction rate and efficiency during plasma therapeutic exchange with Spectra Optia versus Haemonetics MCS. J Clin Apher. 2011;26(1):17–22. 14.Tormey CA, ME, Erickson M, et al. Improved plasma ablation efficiency for plasma therapeutic exchange using a new aphesiy platform. Transfusion. 2010;50(2):471–477. 15.Perotti C, del Fante C, Viarengo GL, Bergamaschi P, Salvaneschi L. Therapeutic Therapeutic Plasma using the new Optia 1.0 spectra. The Italian experience. Vox Sang. 2008;95:20–21. 16.Fuller L, Maru B, Isserlis N, Cerio R. Successful treatment of a patient with severe atopic dermatitis and severe asthma by plasma centrifugal therapeutic exchange. BMJ Case Rep. 2015;2015:bcr2014209008. 17.Puppe B, Kingdon EJ. Membranar therapeutic exchange and plasma centrifuge: practical difficulties in anticoagulation of the extracorporeal circuit. Clin Kidney J. 2014;7 (2):201-205. 18.Balint B, Todorovic-Balint M, Ostojic G, et al. Immediate benefit of plasma exchange in the treatment of severe hypertriglycerides using spectra-optia vs cobe-spectra. Vox Sang. 2013;105:256–256. 19.Hussein EA, El Ansary M. Egyptian experiment comparing plasma exchange on the new optia spectra apheresis with previous COBE spectra. Transfusion. 2012;52:20A-21. 20.Hester JP, Mccullough J, Mishler JM, Szymanski IO. Dosing regimens for citrate anticoagulants. J Clin Apher. 1983;1(3):149–157. 21.Handschel D, Etienne Janssens M, Gericke M, de Reys S, Borberg H. Comparative evaluation of heparin-citrate anticoagulation for LDL-apheresis in two primary systems of aphesy. J Clin Apher. 2017;32(5):319-328. 22.Rummler S, Volkholz S, Steinke T, et al. Spectra Optia apheresis system: experiment with secondary plasma devices. Int J Clin Transfus Med. 2017;5:61-67. 23.Poullin P, Sanderson F, Bernit E, Brun M, Berdah Y, Badens C. Comparative evaluation of the red cell exchange of exhaustion program with Spectra Optia and the isovolemic method of exchange of hemodilution-red cells with COBE Spectra in patients with sicklelytosis. J Clin Apher. 2016;31(5):429–433. 24.Kim J, Joseph R, Matevosyan K, Sarode R. Comparison of performance of Spectra Optia and COBE Spectra apheresis for red blood cell exchange procedures. Apher Sci Transfus. 2016;55(3):368-370. 25.Daniel MJ, Muddegowda PH, Chezhiansubash LJB, Lingegowda JB, Gopal N, Prasad K. Study of twenty-one cases of red blood cell exchange in a tertiary care hospital in southern India. J Clin Diagn Res. 2016;10(5):EC28- EC30. 26.Quirolo K, Bertolone S, Hassell K, et al. Evaluation of a new apheresis device for automated red blood cell exchange procedures in patients with sickle cell disease. Transfusion. 2015;55(4):775–781. 27.Grabmer C, Schmid D, Mayer G, et al. Iron exhaustion with a new system of oasmatism in patients with hemochromatosis. Transfusion. 2015;55(5):996–1000. 28.Ratcliffe N, Dunbar NM, Adamski J, et al. National Institutes of Health State of the Science Symposium in Therapeutic Apheresis: scientific opportunities in extracorporeal photopheresis. Med Rev transfus. 2015;29(1):62-70. 29.del Fante C, Scudeller L, Viarengo G, Cervio M, Perotti C. Mononuclear cell collection for extracorporeal a study comparing an automatic and a semiautomatic apheresis device. Transfusion. 2013;53(9):2027–2033. 30.Schulz M, Bialleck H, Thorausch K, et al. Leukemia not formulated in patients and donors: two systems of aphesy. Transfusion. 2014;54(6):1622–1629. 31.Piccirillo N, Putzulu R, Massini G, et al. Collection of mononuclear cells for extracorporeal photophesis: Focus the characteristics of the UV-A irradiation procedure offline. J Clin Apher. 32.Edelson RL. Mechanistic insights into extracorporeal photochemistry: effective induction of monocyte-to-dendritic cell maturation. Apher Sci Transfus. 2014;50(3):322-329. 33.Brosig A, Hhnel V, Orsa E, Wolff D, Holler E, Ahrens N. Technical comparison of four different extracorporeal photopheresis systems. Transfusion. 2016;56(10):2510–2519. 34.Punzel M, Kozlova A, Quade A, Schmidt AH, Smith R. Evolution of MNC and lymphocytes collection settings employing different Spectra Optia® Leukapheresis systems. Vox Sang. 2017;112(6):586–594. 35.Maachowski R, Grzybowska-Izydorczyk O, Besson N, Szmigielska-Kapon A, Nowicki M, Wierzbowska A. Safety and feasibility of therapeutic platelet depletion with Spectra Optia in a pregnant woman. Apher Sci Transfus. 2017;56(4):563-565. 36.Cline A, Jajosky R, Shikle J, Bollag R. Comparing leukemia protocols for an AMA patient with symptomatic leukostasis. J Clin Apher. 2017. 37.Schulz M, Bug G, Bialleck H, Serve H, Seifried E, Benig H. Leucodepletion for hyperleucocytosis: first report on a new technology featuring electronic interphase management. Vox Sang. 2013;105(1):47–53. 38.Schwenger V, Morath C. Immunoadsorption in nephrology and kidney transplantation. Nephrol Dial Transplant. 2010;25(8):2407–13. 39.Ward DM. Conventional Aphesy Therapies: An Examination. J Clin Apheresis. 2011;26(5):230–8. 2011;26(5):230–8.