**SUPPLEMENTAL CONTENT**

TABLE 1 *Baseline Patient Characteristics*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  Study # | Age | Sex | BMI | HTN | DM | Smoking | Obesity | Malignancy | Hyperlipidemia | CAD | PVD | Anemia | Stroke | No. of vascular risk factors |
| Cobar et al. (2016)1 1 | 52 | Female |   |  |  | Yes |  |  |  |  |  |  |  | 1 |
| Alexandrakis (19992  2 | 68 | Female |   | No | Yes | No | No | No | No | No | No | Yes | No | 1 |
| Brown et al. (1994)3 3 | 13 | Male |   | No | No | No | No | No | No | No | No | No | No | 0 |
| Dunker (2002)4 45678 | 66 | Male |   | Yes | Yes |  |  |  |  |  | Yes |  |  | 2 |
| 43 | Male |   |  |  |  |  |  |  |  |  |  |  | 1 |
| 12 | Male |   | No | No | No |  |  |  |  | No |  |  | 0 |
| 57 | Male |   | Yes | Yes |  |  |  |  |  |  |  |  | 3 |
| 44 | Male |   |  |  |  |  |  |  |  |  |  |  | 2 |
| Katz (1994)5 9101112 | 49 | Female |   | Yes | No | No | No | No | No | No | No | No | No | 1 |
| 65 | Female |   | No | No | No | No | No | No | No | No | No | No | 0 |
| 60 | Female |   | Yes | Yes | No | No | No | No | Yes | No | No | No | 3 |
| 41 | Male |   | No | Yes | Yes | No | No | No | No | No | No | No | 2 |
| 13 | 48 | Male |   | Yes |  | Yes |  |  |  |  |  |  |  | 2 |
| Lee AG (1995)6 14 | 58 | Male |   |  |  | Yes |  |  |  |  |  |  |  | 1 |
| Lee LA (2001)7 15 | 24 | Male | 25.8 | No | No | No |  |  |  |  |  |  |  | 0 |
| Roth (1997)8 16 | 44 | Male |   | Yes |  |  |  |  |  |  |  |  |  | 1 |
| Stevens (1997)9 17181920 | 27 | Female |   |  |  |  |  |  |  |  |  |  |  |  |
| 56 | Female |   | Yes | No | No | No | No | No | No | No | No | No | 1 |
| 37 | Male |   | Yes |  |  |  |  |  |  |  |  |  | 1 |
| 79 | Female |   | Yes | No | No | No | No | No | No | No | No | No | 1 |
| Murphy (2003)10 21 | 33 | Female |   |  |  | No |  |  |  |  |  |  |  |  |
| Mohan (2012)11 22 | 50 | Female | 30.26 | Yes | Yes |  |  |  |  |  |  |  |  |  |
| Heitz (2008)12 23 | 59 | Female | 58.5 | Yes | Yes | Yes |  |  |  |  |  |  |  |  |
| Chalam (2005)13 24 | 55 | Female |   | No | No | No | No | No | No | No | No | No | No |  |
| Abraham (2003)14 25 | 24 | Male |   | No | No | No | No | No | No | No | No | Yes | No | 0 |
| Holy (2009)15 26272829 | 63 | Male |   |  |  |  |  |  |  |  |  |  |  |  |
| 77 | Male |   |  |  |  |  |  |  |  |  |  |  |  |
| 71 | Male |   |  |  |  |  |  |  |  |  |  |  |  |
| 66 | Male |   |  |  |  |  |  |  |  |  |  |  |  |
|  Akpinar (2017)16 30 | 54 | Male |   | No | No | No | No | No | No | No | No | No | No | 0 |
| Bojinova(2016)17 31 |  | Male | 14.9 | No | No | No | No | No | No | No | No | No | No | 0 |
| Chang (2005)18 32333435 | 13 |   |   |  |  |  |  |  |  |  |  |  |  |  |
| 13 |   |   |  |  |  |  |  |  |  |  |  |  |  |
| 43 |   |   |  |  |  |  |  |  |  |  |  |  |  |
| 29 |   |   |  |  |  |  |  |  |  |  |  |  |  |
| Delattre (2007)19 3637383940 | 53 | Male |   | No | No | No | No | No | No | Yes | No | No | No | 2 |
| 22 | Female |   | No | No | No | No | No | No | No | No | No | No | 0 |
| 68 | Male |   |  |  |  |  |  |  | Yes |  |  |  | 1 |
| 47 | Male |   |  |  |  |  |  |  |  |  |  |  |  |
| 73 | Male |   |  |  |  |  |  |  |  |  |  |  |  |
| Dilger(1998)20 41 | 44 | Male | 36.5 |  | Yes |  | Yes |  |  |  |  |  |  | 2 |
|  Study # | **Age** | **Sex** | **BMI** | **HTN** | **DM** | **Smoking** | **Obesity** | **Malignancy** | **Hyperlipidemia** | **CAD** | **PVD** | **anemia** | **Stroke** | **No. of vascular risk factors** |
| Gaillard(2004)21 42 | 51 | Male |   |  |  |  |  |  |  |  |  |  |  |  |
| Golmirzaie (2011)22 43 | 62 | Female |   |  |  |  |  |  |  |  |  |  |  |  |
| Hassani (2014)23 44 | 61 | Male | 23.14 | No | No | No | No | No | No | No | No | No | No | 0 |
| Hoff (2010)24 45 | 56 | Male |   | No | No | No | No | No | No | Yes | No | No | No | 1 |
| Kamming (2005)25 46 | 60 | Male | 23.14 | No | No | No | No | Yes | No | No | No | No | No | 0 |
| Katzman(1994)26 47 | 57 | Male |   | No | Yes | No | Yes | No | No | No | No | No | No | 2 |
| Kim (2006)27 48 49 | 16 | Female |   |  |  |  |  |  |  |  |  |  |  |  |
| 10 | Male |   |  |  |  |  |  |  |  |  |  |  |  |
| Kumar (2004)28 50 | 16 | Female |   |  |  |  |  |  |  |  |  |  |  |  |
| Nabiuni (2014)29 51 | 58 | Female |   | No | Yes | No | No | No | No | No | No | No | No | 1 |
| Pin-On (2015)30 52 | 64 | Male | 27.9 | Yes | Yes | No | No | No | Yes | No | No | No | No | 2 |
| Quraishi (2012)31 53 | 44 | Male | 37.2 | No | No | No | No | No | No | No | No | No | No | 0 |
| Reddy (2008)32 54 | 55 | Male |   |  |  |  |  |  |  | Yes |  |  |  |  |
| Samdani(2009)33 55 | 15 | Male |   |  |  |  |  |  |  |  |  |  |  |  |
| Shifa(2016)34 56 | 17 | Male | 17.9 | No | No | No | No | No | No | No | No | No | No | 0 |
| Yu (2008) 35 57 | 68 | Male |   | Yes | Yes | No | No | No | No | No | No | No | No | 2 |
| Corso (2006)36  58 | 58 | Male | 38 | No | No | No | No | No | No | No | No | No | No | 0 |
| Leibovitch(2006)37 59 | 80 | Male |   |  |  |  |  |  |  |  |  |  |  |  |
| Stang-Veldhous (2010)38 60 | 44 | Male | 39.8 | Yes | Yes |  |  |  | Yes |  |  |  |  | 3 |
| West (1990)39 61 | 50 | Female |   | No | No | No | No | No | No | No | No | No | No | 0 |
| Yi (2004)40  62 | 38 | Male | 18.4 | No | No | No | No | No | No | No | No | No | No | 0 |
| Lee(2006)41 63-145 (83) | 50 ± 14 | 60 Male (72)23 Female (28) |  | 34 (41) | 13 (16) | 38 (46) | 44 (53) |  |  | 8 (10) |  |  |  |  |
| Myers (1997)42 146-182 (37) | 46.5 |  |  | 13/31 (42) | 6/31 (19) | 11/26 (42) |  |  |  |  | 5/29 (17) |  |  |  |

BMI=body mass index, HTN=hypertension, DM=diabetes mellitus, CAD=coronary artery disease, PVD= peripheral vascular disease

**TABLE 2.** *Perioperative parameters*

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  Study # ## | Type | Level | No. of levels | Location | Position | Approach | Change in HCT% | Change in HB | lowest SBP | EBL(ml) | Operative time | Edema |
| Cobar et al. (2016)1 1  | decompression and fusion | L4-L5 | 1 | Lumbar | prone | posterior |  | 4.5 |  | 600 | 270 | No |
| Alexandrakis (1999)2 2 | decompression and fusion | L3-L5 | 2 | Lumbar | prone | posterior |  |  | 95 | 3000 | 480 | Yes |
| Brown et al. (1994)3 3 | fusion |  |  |  | prone | posterior |  | 2.8 | 52 | 8000 |  |  |
| Dunker (2002)4 4 | decompression and fusion | L3-S1 | 3 | Lumbar |  |  | 9.5 |  | 120 | 2400 | 300 | Yes |
|  5 | decompression and fusion | L3-L5 | 2 | Lumbar |  |  | 12.2 |  | 100 | 2000 | 510 | Yes |
| 6 | fusion | T3-S1 | 15 | Thoracolumbar |  |  | 17 |  | 80 | 2500 | 360 |  |
| 7 | decompression and fusion | L3-S1 | 3 | Lumbar |  |  | 17 |  | 90 | 16000 | 480 | Yes |
| 8 | decompression and fusion | L5-S1 | 1 | Lumbar |  |  | 11 |  | 80 | 1200 | 510 |  |
| Katz (1994)5  9 | fusion | L3-L5 | 2 | Lumbar | circumferential | circumferential |  | 3 | 85 | 2000 | 510 | No |
| 10 | decompression | L3-L5 | 2 | Lumbar | prone | posterior |  | 6 | 90 | 500 |  |  |
| 11 | decompression and fusion | L3-L5 | 2 | Lumbar | prone | posterior |  | 7.8 | 95 | 2000 |  |  |
| 12 | decompression and fusion | L4-S1 | 2 |  |  |  |  | 3.6 | 85 | 2000 |  |  |
| 13 | decompression and fusion | L2-S1 | 4 | Lumbar | supine |  |  | 4.2 | 80 | 1500 |  |  |
| Lee AG (1995)6  14 | fusion | L2-3 | 1 | Lumbar | prone |  | 10 |  | 70 | 800 | 390 | Yes |
| Lee LA (2001)7 15 | decompression and fusion | L1-2 | 1 | Lumbar | prone |  | 24 |  | 80 |  | 300 | No |
| Roth (1997)8 16 | decompression and fusion |  |  | Lumbar | prone | posterior | 16.5 |  | 80 | 4200 | 570 | Yes  |
| Stevens (1997)9 17 | fusion | T10-S1 | 8 | thoracic |  | circumferential |  |  |  | 5000 |  |  |
| 18 | decompression and fusion | L4-S1 | 2 | Lumbar | circumferential | circumferential | 4 |  | 75 | 850 | 360 | No |
| 19 | decompression and fusion | T3-T12 | 8 | thoracic | circumferential | circumferential | 11 |  |  | 9000 |  |  |
| 20 | decompression and fusion | T10-L4 | 6 | Thoracolumbar |  | posterior | 6.3 |  | 80 | 2200 | 372 |  |
| Murphy (2003)10 21 | fusion | L5-S1 | 1 | Lumbar | circumferential | circumferential |  | 2.2 | 85 | 1200 | 540 | Yes |
| Study # | **Type** | **Level** | **No. of levels** | **Location** | **Position** | **Approach** | **Change in HCT%** | **Change in HB** | **lowest SBP** | **EBL(ml)** | **Operative time** | **Edema** |
| Mohan (2012)11 22 | decompression and fusion | L2-5 | 3 | Lumbar | prone |  |  | 6 |  | 900 | 210 | No |
| Heitz (2008)12  23 | decompression and fusion | T8-9 | 1 | thoracic | lateral |  |  | 1.4 |  | 250 | 450 | Yes |
| Chalam (2005)13 24 | fusion | L4-S1 | 2 | Lumbar | prone | posterior | 14.8 |  | 65 |  | 690 | Yes |
| Abraham (2003)14 25 | fusion | C1-C2 | 1 | cervical | prone | posterior |  |  |  | 300 | 180 | No |
| Holy (2009)15 26 | fusion | L4-S1 | 2 | Lumbar | prone | posterior |  |  |  |  |  |  |
| 27 | decompression and fusion | T10-L5 | 7 | Thoracolumbar | prone | posterior |  |  |  |  |  |  |
|  28 | fusion | T5-T7 | 2 | thoracic | supine | anterior |  |  |  |  |  |  |
|  29 | decompression and fusion | L4-L5 | 1 | Lumbar | circumferential | circumferential |  |  |  |  |  |  |
| Akpinar (2017)16 30 | fusion | L1-L5 | 4 | Lumbar | prone | posterior |  |  | 90 | 500 | 270 |  |
| Bojinova(2016)17 31 | fusion |  |  |  |  |  | 8.1 | 1.7 | 50 | 1400 | 480 |  |
| Chang (2005)18 32  | fusion | T6-L2 | 8 | Thoracolumbar | prone | posterior | 20.2 |  | 43 | 8000 | 335 | Yes |
| 33 | fusion | T4-T10 | 6 | thoracic | lateral | anterior | 5.5 |  | 60 | 1300 | 369 | No |
| 34 | vertebrectomy, posterior decompression and fusion | L3-L5 | 2 | Lumbar | prone | posterior | 14.9 |  |  | 7000 | 630 | Yes |
|  35 | fusion | L3-S1 | 3 | Lumbar | prone | posterior | 13 |  | 68 | 1050 | 236 | No |
| Delattre (2007)19 36 | fusion |  |  | Lumbar |  |  |  |  |  |  | 130 |  |
| 37 | vertebrectomy and fusion | C5 | 1 | cervical |  |  |  |  |  |  | 100 |  |
| 38 | fusion |  |  | cervical |  |  |  |  |  |  | 300 |  |
| 39 | vertebrectomy and fusion |  |  | Thoracolumbar |  |  |  |  |  |  | 120 |  |
|  40 | decompression | L4-L5 | 1 | Lumbar |  |  |  |  |  |  | 90 |  |
| Dilger(1998)20 41 | decompression and fusion | L4-L5 | 1 | Lumbar | prone | posterior |  | 4 | 90 | 3000 | 720 |  |
| Gaillard(2004)21 42 |  |  |  | Lumbar |  |  |  |  |  | 2500 | 720 |  |
| Golmirzaie (2011)22 43  | decompression and fusion | L4-S1 | 2 | Lumbar |  |  |  |  |  |  |  |  |
| Hassani (2014)23 44 | decompression and fusion | C7-T1 | 1 | Cervicothoracic | prone | posterior |  |  |  | 2500 | 360 |  |
| Hoff (2010)24 45 |  | C3-C4 | 1 | cervical | prone | posterior |  |  | 80 | 800 | 120 |  |
| Kamming (2005)25 46 | decompression and fusion | C3-T5 | 9 | Cervicothoracic | prone | posterior |  | 8.2 | 90 | 6000 | 420 | Yes |
| Katzman(1994)26 47 | decompression and fusion | L3-S1 | 3 | Lumbar | prone | posterior |  |  | 90 | 16000 | 540 |  |
| Kim (2006)27 48 | fusion | T1-S1 | 18 | Thoracolumbar | prone | posterior |  | 8.2 | 80 | 4000 | 780 |  |
|  49  | decompression and fusion |  |  | Lumbar | prone | posterior |  | 6.4 | 70 | 3600 | 690 | Yes |
| Kumar (2004)28 50 |  |  |  |  | prone | posterior |  |  |  |  | 420 |  |
| Study # | **Type** | **Level** | **No. of levels** | **Location** | **Position** | **Approach** | **Change in HCT%** | **Change in HB** | **lowest SBP** | **EBL(ml)** | **Operative time(min)** | **Edema** |
| Nabiuni (2014)29 51 | fusion |  |  |  | prone | posterior |  |  | 95 |  | 365 | Yes |
| Pin-On (2015)30 52 | decompression and fusion | L2-L5 | 3 | Lumbar | prone | posterior |  |  | 85 | 350 | 275 | Yes |
| Quraishi (2012)31 53 | fusion | L3-L5 | 2 | Lumbar | prone | posterior |  | 2.6 | 100 | 1500 | 480 | No  |
| Reddy (2008)32 54 | decompression |  |  |  | prone | posterior |  |  | 90 | 900 | 270 | No |
| Samdani(2009)33 55 | fusion | T2-S1 | 16 | Thoracolumbar | prone | posterior |  | 6.8 | 70 | 4000 | 479 |  |
| Shifa(2016)34 56 | decompression | C5-C6 | 1 | cervical | prone | posterior |  |  |  |  | 240 |  |
| Yu (2008) 35 57 | decompression and fusion | L3-L5 | 2 | Lumbar | prone | circumferential |  |  |  | 1150 | 240 | Yes |
| Corso (2006)36 58 | decompression and fusion | L2-L4 | 2 | Lumbar | prone | posterior |  |  |  |  | 330 |  |
| Leibovitch(2006)37 59 | decompression | L3-L5 | 2 | Lumbar | prone | posterior |  |  |  |  | 480 | Yes |
| Stang-Veldhous (2010)38 60 | decompression and fusion | T3-L2 | 11 | Thoracolumbar | prone | posterior |  |  |  | 2700 | 660 |  |
| West (1990)39 61 | decompression and fusion | L1-L3 | 2 | Lumbar | prone | posterior |  |  | 70 | 1000 | 270 | Yes |
| Yi (2004)40 62 | decompression |  | 2 |  | prone | posterior |  |  |  |  |  | No |
| Lee(2006)41  63-145 (83)  | Fusion- 74(89%) |  | 1 level 9(11)2 levels 19(23)3 levels 15(18)4levels above 30(36)Unknown 10(12) | Cervical4(5)Thoracic 11(13)Lumbar 57(69)Thoracolumbar 5(6)Unknown 6(7) | prone 83(100) |  | 26±5 |  | ≤70 5(6)71-80 12(14)81-90 35(42)91-100 17(20)101-110 7(8)≥110 4(5)Unknown 3(4) | 2000 \* (100- 25000) | 588±186‡ |  |
| Myers (1997)42  146-182 (37) | Fusion-36(92%) |  | 3.4¶ |  | Prone 36/37(97) | Posterior 36/37 | 28 (18-36) |  | 77 (0-98) | 3500 (400-18000) | 410 (120-750)† |  |

EBL=estimated blood loss, HCT=hematocrit, HB= hemoglobin, MAP=arterial blood pressure, SBP=systolic blood pressure

\*EBL is reported as median and range

†Operative time is reported as median and range

‡Operative time reported as mean, SD

¶ Mean No. of levels

**TABLE 3.** *Postoperative course and follow up*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Study # | Diagnosis | Onset | Disk edema | Disk pallor | Laterality | Bilateral severity | RAPD | VFD | Visual acuity (WHO) | Color vision | VFD follow-up | Visual acuity follow-up | Color follow-up | Disk pallor | outcome |
| Cobar et al. (2016)1 1  | PION | <24h |  | Yes | OD |  |  | Yes |  |  |  |  |  |  | No improvement |
| Alexandrakis (1999)2 2 | PION | <24h | No | No | OU | OS=OD | No RAPD | Yes | Blindness | Yes | No improvement | No improvement | No improvement | Yes | No improvement |
| Brown et al. (1994)3 3 | PION | < 24h | No | No | OU | OS>OD |  RAPD | Yes | Severe |  | Improved | Improved |  | Yes | Some improvement |
| Dunker (2002)4 45678 | PION | 24-48h | No | No | OU | OS=OD |  | Yes | Blindness | Yes | Worsened | Worseneded | Worsened | Yes | Worseneding |
| PION | < 24h | No | No | OU | OS=OD | No RAPD | Yes | Blindness |  | Improved | Improved |  | Yes | Some improvement |
| PION | < 24h | No | No | OU | OS=OD | No RAPD | Yes | Blindness |  | No improvement | No improvement |  |  | No improvement |
| PION | < 24h | No | No | OU | OS<OD |  | Yes | Blindness |  | No improvement | No improvement |  | Yes | No improvement |
| PION | < 24h | No | No | OU | OS=OD |  | Yes | Blindness |  | Improved | Improved |  | Yes | Some improvement |
| Katz (1994)5 910111213 | PION | < 24h | No | No | OU | OS=OD | No RAPD | Yes | Blindness |  | Improved | Improved |  | Yes | Some improvement |
| ION | 24-48h | No | Yes | OU | OS<OD | RAPD | Yes | Blindness |  | No improvement | Improved |  | Yes | Some improvement |
| ION | >9 days | Yes | Yes | OS |  | RAPD | Yes | Moderate |  | No improvement | No improvement |  | Yes | No improvement |
| ION | < 24h | Yes | Yes | OD |  | RAPD | Yes | Blindness |  | No improvement | No improvement |  | Yes | No improvement |
| PION | < 24h | No | No | OD |  | RAPD |  | Blindness | Yes | No improvement | No improvement | No improvement | Yes | No improvement |
| Lee AG (1995)6 14  | PION | < 24h | No | No | OS |  | RAPD | Yes | Blindness | Yes | No improvement | Improved | Worsened | Yes | Some improvement |
| Lee LA (2001)7 15  | PION | < 24h | No | No | OD |  | RAPD | Yes | No or Mild impairment |  | No improvement | Improved |  | Yes | Some improvement |
| Roth (1997)8 16  | PION | 24-48h | No | No | OS |  | RAPD | Yes | Blindness |  | No improvement | No improvement |  | Yes | No improvement |
| Stevens (1997)9 17 181920 | PION | 24-48h | No | No | OS |  | No RAPD | Yes | No or Mild impairment |  | No improvement | No improvement |  | No | No improvement |
| AION | < 24h | Yes |  | OS |  | RAPD | Yes | Moderate |  | Improved | Improved |  |  | Some improvement |
| PION | < 24h |  |  | OS |  | RAPD | Yes | Blindness |  | No improvement | No improvement |  |  | No improvement |
| PION | 24-48h | No | No | OU | OS<OD |  | Yes | Blindness |  | Improved | Improved |  |  | Some improvement |
| Study # | **Diagnosis** | **Onset** | **Disk edema** | **Disk pallor** | **Laterality** | **Bilateral severity** | **RAPD** | **VFD** | **Visual acuity (WHO)** | **Color vision** | **VFD follow-up** | **Visual acuity follow-up** | **Color vision follow-up** | **Disk pallor** | **outcome** |
| Murphy (2003)10 21  | PION | < 24h | No | No | OU | OS=OD | No RAPD | Yes | Blindness | Yes | Improved | Improved | Improved | Yes | No improvement |
| Mohan (2012)11 22 | ION | < 24h | No | No | OD |  | RAPD | Yes | Blindness |  | No improvement | No improvement |  | Yes | No improvement |
| Heitz (2008)12 23  | PION | 24-48h | No | No | OU | OS<OD | RAPD | Yes | Blindness |  | No improvement | No improvement |  | No | No improvement |
| Chalam (2005)13 24  | PION | < 24h | No | No | OU | OS=OD | RAPD | Yes | Blindness |  | Improved | Improved |  | Yes | Some improvement |
| Abraham (2003)14 25  | ION | < 24h | No | No | OD |  | RAPD | Yes | Blindness |  | No improvement | Improved | Worsened | Yes | Some improvement |
| Holy (2009)15 26  272829 | PION |  | No | No | OU | OS>OD | RAPD | Yes | Blindness |  |  |  |  | Yes | No improvement |
| PION |  | No | No | OU | OS=OD | RAPD | Yes | Blindness | Yes | No improvement | No improvement | No improvement | Yes | No improvement |
| AION |  | Yes | No | OU | OS<OD | RAPD |  | Blindness |  |  |  |  |  |  |
| PION |  | No | No | OU | OS<OD | RAPD | Yes | Severe |  | Improved |  |  | Yes | Some improvement |
| Akpinar (2017)16 30  | ION | < 24h |  | Yes | OS |  | RAPD | Yes | Blindness | Yes | No improvement | No improvement | No improvement | Yes | No improvement |
| Bojinova(2016)17 31  | ION |  |  | Yes | OS |  | RAPD | Yes | Blindness | Yes | Improved | No improvement | No improvement | Yes | No improvement |
| Chang (2005)18 32 33 34  35  | PION | < 24h | No | No | OS |  | RAPD | Yes |  | Yes | Improved | Improved | Improved | Yes | Some improvement |
| PION | < 24h | No | No | OS |  | RAPD | Yes |  | Yes | No improvement | No improvement | No improvement | Yes | No improvement |
| PION | < 24h | No | No | OS |  | RAPD | Yes |  | Yes | No improvement | No improvement | No improvement | Yes | No improvement |
| PION | < 24h | No | No | OD |  | RAPD | Yes |  | Yes | No improvement | No improvement | No improvement | Yes | No improvement |
| Delattre (2007)19 36  37383940 | ION |  |  |  | OS |  | RAPD | Yes | Blindness | Yes | No improvement | Worsened | No improvement | No | No improvement |
| ION |  |  |  | OS |  |  | Yes | Severe |  | Improved | Improved | Improved |  | Some improvement |
| ION |  |  |  | OS |  |  |  | Moderate |  |  |  |  |  | Some improvement |
| ION |  |  |  | OS |  |  |  | Moderate |  |  |  |  |  | Some improvement |
| ION |  |  |  | OS |  |  |  | Moderate |  |  |  |  |  | Some improvement |
| Study # | **Diagnosis** | **Onset** | **Disk edema** | **Disk pallor** | **Laterality** | **Bilateral severity** | **RAPD** | **VFD** | **Visual acuity (WHO)** | **Color vision** | **VFD follow-up** | **Visual acuity follow-up** | **Color vision follow-up** | **Disk pallor** | **outcome** |
| Dilger(1998)20 41  | AION | 6-9 days | Yes |  | OU | OS=OD | RAPD | Yes | Moderate | Yes | Improved | Improved | Improved |  | Some improvement |
| Gaillard(2004)21 42  | PION | < 24h | No | No | OU | OS=OD | RAPD |  | Blindness | Yes |  | Improved | Improved | Yes | Some improvement |
| Golmirzaie (2011)22 43  | ION |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Hassani (2014)23 44  | PION | < 24h | No | No | OD |  | RAPD | Yes | Blindness | Yes | Improved | Improved | Improved | No | Some improvement |
| Hoff (2010)24 45  | ION | < 24h | No | No | OS |  | RAPD | Yes | Blindness |  | No improvement | Improved |  | Yes | Some improvement |
| Kamming (2005)25 46  | PION | < 24h |  |  | OS |  | RAPD | Yes | Blindness |  | No improvement | No improvement |  | No | No improvement |
| Katzman(1994)26 47  | AION | 3-5 days | No | No | OU | OS<OD | RAPD | Yes | Blindness | No | No improvement | Improved | No improvement | Yes | Some improvement |
| Kim (2006)27 48   49 | ION | 3-5 days | Yes | No | OU | OS>OD | RAPD | Yes | Blindness | Yes | Improved | Improved | Improved | Yes | Some improvement |
| ION | 24-48h | Yes | No | OU | OS=OD | RAPD | Yes | Blindness |  | Improved | Improved |  | Yes | Some improvement |
| Kumar (2004)28 50  | ION | < 24h | Yes | No | OD |  | RAPD | Yes | Blindness | Yes | No improvement | No improvement | No improvement | Yes | No improvement |
| Nabiuni (2014)29 51  | ION | < 24h | No | Yes | OS |  | RAPD | Yes | Blindness | Yes | No improvement | No improvement | No improvement | Yes | No improvement |
| Pin-On (2015)30 52  | ION | < 24h |  |  | OS |  | RAPD |  | Blindness |  |  |  |  |  |  |
| Quraishi (2012)31 53  | PION | < 24h | No | No | OU | OS=OD | RAPD | Yes | Blindness | Yes | Improved | Improved | Improved | No | Some improvement |
| Reddy (2008)32 54  | PION | < 24h | No | No | OU | OS<OD | No RAPD | Yes | Blindness | No | No improvement | Improved | No improvement | Yes | Some improvement |
| Samdani(2009)33 55  | PION | 3-5 days | No | No | OU | OD=OS |  | Yes | Blindness | Yes | No improvement | No improvement | No improvement |  | No improvement |
| Shifa(2016)34 56  | PION | 6-9 days | No | No | OU | OD=OS | RAPD | Yes | Blindness |  | Improved | Improved |  |  | Some improvement |
| Yu (2008)35 57  | ION | < 24h | No | No | OD |  |  | Yes | Blindness | Yes | No improvement | No improvement | No improvement |  | No improvement |
| Corso (2006)36 58  | ION |  |  |  | OS |  |  |  | Blindness |  |  |  |  |  |  |
| Leibovitch(2006)37 59  | ION | < 24h |  |  | OS |  |  | Yes | Blindness |  | No improvement | No improvement |  |  | No improvement |
| Stang-Veldhous (2010)38 60  | ION | 24-48h | Yes | No | OU | OS=OD |  | Yes | No or Mild impairment |  | No improvement | No improvement |  | No | Some improvement |
| West (1990)39 61  | ION | < 24h | No | No | OS |  | RAPD | Yes | Blindness |  | No improvement | No improvement |  | Yes | No improvement |
| Study # | **Diagnosis** | **Onset** | **Disk edema** | **Disk pallor** | **Laterality** | **Bilateral severity** | **RAPD** | **VFD** | **Visual acuity (WHO)** | **Color vision** | **VFD follow-up** | **Visual acuity follow-up** | **Color follow-up** | **Disk pallor** | **outcome** |
| Yi (2004)40 62  | PION | < 24h | Yes | No | OS |  | RAPD | Yes | Severe |  | Improved | Improved |  |  | Some improvement |
| Lee(2006)41  63-145 (83)  | 56(67)PION19(23)AION8(10)ION |  |  |  | OU 55(66)OD or OS 28 (34) |  |  |  | 47 (57) Blindness5/8 ION 8/19 AION34/56 PION |  |  |  |  |  | Some improvement 35(42)No improvement 48(58) |
| Myers (1997)42  146-182 (37)  | 14/37 PION8/37 AION15/37 ION |  |  |  | OU 11(30)OD or OS 26(70) |  |  | Partial VFD in 18 patient | 15 Blindness |  | 5 improved | 8 improved  |  |  | 25 No improvement1 gotten worse |

VFD=visual field defect, ION= ischemic optic neuropathy, AION= anterior ischemic optic neuropathy, PION= posterior ischemic optic neuropathy, OU= bilateral, OD= right eye, OS= left eye, RAPD= relative afferent pupillary defect. WHO scale was used to define visual acuity; patients equal to or better than 6/18, 3/10, 20/70 were defined as **mild** or no visual impairment; patients worse than 6/18, 3/10, 20/70 or equal to or better than 6/60, 1/10, 20/200 were defined as **moderate** visual impairment; patients worse than 6/60, 1/10, 20/200 or equal to or better than 3/60, 1/20, 20/400 were defined as **severe** visual impairment; **blindness** was defined for any patient who was worse than 3/60, 1/20, 20/400, 1/60, 1/50, 5/300, no perception of light or any patient who is equal to or better than 1/60 or counts fingers at 1 meter, 1/50, 5/300, light perception alone.

**REFERENCES**

1. Cobar-Bustamante AE, Cahueque MA, Caldera G. Visual loss after spine surgery: Case report. *J Orthop.* 2016;13(4):239-241.

2. Alexandrakis G, Lam BL. Bilateral posterior ischemic optic neuropathy after spinal surgery. *Am J Ophthalmol.* 1999;127(3):354-355.

3. Brown RH, Schauble JF, Miller NR. Anemia and hypotension as contributors to perioperative loss of vision. *Anesthesiology.* 1994;80(1):222-226.

4. Dunker S, Hsu HY, Sebag J, Sadun AA. Perioperative risk factors for posterior ischemic optic neuropathy. *J Am Coll Surg.* 2002;194(6):705-710.

5. Katz DM, Trobe JD, Cornblath WT, Kline LB. Ischemic optic neuropathy after lumbar spine surgery. *Arch Ophthalmol.* 1994;112(7):925-931.

6. Lee AG. Ischemic optic neuropathy following lumbar spine surgery. Case report. *J Neurosurg.* 1995;83(2):348-349.

7. Lee LA, Lam AM. Unilateral blindness after prone lumbar spine surgery. *Anesthesiology.* 2001;95(3):793-795.

8. Roth S, Nunez R, Schreider BD. Unexplained visual loss after lumbar spinal fusion. *J Neurosurg Anesthesiol.* 1997;9(4):346-348.

9. Stevens WR, Glazer PA, Kelley SD, Lietman TM, Bradford DS. Ophthalmic complications after spinal surgery. *Spine.* 1997;22(12):1319-1324.

10. Murphy MA. Bilateral posterior ischemic optic neuropathy after lumbar spine surgery. *Ophthalmology.* 2003;110(7):1454-1457.

11. Mohan K, Rawall S, Nene A. Visual loss after spine surgery. *Indian J Orthop.* 2012;46(1):106-108.

12. Heitz JW, Audu PB. Asymmetric postoperative visual loss after spine surgery in the lateral decubitus position. *Br J Anaesth.* 2008;101(3):380-382.

13. Chalam KV, Shah VA. Severe bilateral posterior ischemic optic neuropathy as a complication of spinal surgery [12]. *Eye.* 2005;19(3):367-368.

14. Abraham M, Sakhuja N, Sinha S, Rastogi S. Unilateral visual loss after cervical spine surgery. *J Neurosurg Anesthesiol.* 2003;15(4):319-322.

15. Holy SE, Tsai JH, McAllister RK, Smith KH. Perioperative ischemic optic neuropathy: a case control analysis of 126,666 surgical procedures at a single institution. *Anesthesiology.* 2009;110(2):246-253.

16. Akpinar E, Gürbüz MS, Bitirgen G, Okutan MO. Unilateral vision loss without ophthalmoplegia as a rare complication of spinal surgery. *J Neurosci Rural Pract.* 2017;8(2):288-290.

17. Bojinova RI, Konieczka K, Todorova MG. Unilateral Loss of Vision after Spinal Surgery in a Patient with Flammer Syndrome. *Klin Monatsbl Augenheilkd.* 2016;233(4):429-431.

18. Chang SH, Miller NR. The incidence of vision loss due to perioperative ischemic optic neuropathy associated with spine surgery: The Johns Hopkins Hospital experience. *Spine.* 2005;30(11):1299-1302.

19. Delattre O, Thoreux P, Liverneaux P, et al. Spinal surgery and ophthalmic complications: A French survey with review of 17 cases. *Journal of Spinal Disorders and Techniques.* 2007;20(4):302-307.

20. Dilger JA, Tetzlaff JE, Bell GR, Kosmorsky GS, Agnor RC, O'Hara Jr JF. Ischaemic optic neuropathy after spinal fusion. *Can J Anaesth.* 1998;45(1):63-66.

21. Gaillard MC, Zambaz BD, Borruat FX. Posterior ischemic optic neuropathy: Case report of a rare complication after general surgery. *Klin Monatsbl Augenheilkd.* 2004;221(5):421-423.

22. Golmirzaie G, Moore LE. Postoperative visual loss in spine patients. *Case Studies in Neuroanesthesia and Neurocritical Care*: Cambridge University Press; 2011:150-153.

23. Hassani V, Mohsen Homaei M, Shahbazi A, et al. Human erythropoietin effect in postoperative visual loss following spine surgery: A case report. *Anesth Pain Med.* 2014;4(2):e7291.

24. Hoff JM, Varhaug P, Midelfart A, Lund-Johansen M. Acute visual loss after spinal surgery. *Acta Ophthalmologica.* 2010;88(4):490-492.

25. Kamming D, Clarke S. Postoperative visual loss following prone spinal surgery. *Br J Anaesth.* 2005;95(2):257-260.

26. Katzman SS, Moschonas CG, Dzioba RB. Amaurosis secondary to massive blood loss after lumbar spine surgery. *Spine.* 1994;19(4):468-469.

27. Kim JW, Hills WL, Rizzo JF, Egan RA, Lessell S. Ischemic optic neuropathy following spine surgery in a 16-year-old patient and a ten-year-old patient. *J Neuroophthalmol.* 2006;26(1):30-33.

28. Kumar N, Jivan S, Topping N, Morrell AJ. Blindness and rectus muscle damage following spinal surgery. *Am J Ophthalmol.* 2004;138(5):889-891.

29. Nabiuni M, Sarvarian S. Postoperative visual loss after spine surgery: A case report. *Neurosurg Q.* 2014;24(2):94-97.

30. Pin-On P, Boonsri S, Inventors. Postoperative visual loss in orthopedic spine surgery in the prone position: a case report. US patent 0125-2208. Mar, 2015.

31. Quraishi NA, Wolinsky JP, Gokaslan ZL. Transient bilateral post-operative visual loss in spinal surgery. *Eur Spine J.* 2012;21 Suppl 4:S495-498.

32. Reddy A, Foroozan R, Edmond JC, Hinckley LK. Dilated superior ophthalmic veins and posterior ischemic optic neuropathy after prolonged spine surgery. *J Neuroophthalmol.* 2008;28(4):327-328.

33. Samdani AF, Rutter L, Betz RR, Mulcahey MJ. Vision loss after spinal fusion for scoliosis in a child with spinal cord injury. *J Spinal Cord Med.* 2009;32(5):591-594.

34. Shifa J, Abebe W, Bekele N, Habte D. A case of bilateral visual loss after spinal cord surgery. *Pan Afr Med J.* 2016;23:119.

35. Yu YH, Chen WJ, Chen LH, Chen WC. Ischemic orbital compartment syndrome after posterior spinal surgery. *Spine (Phila Pa 1976).* 2008;33(16):E569-572.

36. Corso CM, Tanaka PP, Khon K. Optic nerve ischemia after spine surgery. Case report. *Rev Bras Anestesiol.* 2006;56(3):273-277.

37. Leibovitch I, Casson R, Laforest C, Selva D. Ischemic orbital compartment syndrome as a complication of spinal surgery in the prone position. *Ophthalmology.* 2006;113(1):105-108.

38. Stang-Veldhouse KN, Yeu E, Rothenberg DM, Mizen TR. Unusual presentation of perioperative ischemic optic neuropathy following major spine surgery. *J Clin Anesth.* 2010;22(1):52-55.

39. West J, Askin G, Clarke M, Vernon SA. Loss of vision in one eye following scoliosis surgery. *Br J Ophthalmol.* 1990;74(4):243-244.

40. Yi HJ, Kim DW. Reversible unilateral blindness after lumbar spine surgery: A role for cerebrospinal fluid leakage? [3]. *J Neurosurg Anesthesiol.* 2004;16(4):322-323.

41. Lee LA, Roth S, Posner KL, et al. The American Society of Anesthesiologists Postoperative Visual Loss Registry: analysis of 93 spine surgery cases with postoperative visual loss. *Anesthesiology.* 2006;105(4):652-659; quiz 867-658.

42. Myers MA, Hamilton SR, Bogosian AJ, Smith CH, Wagner TA. Visual loss as a complication of spine surgery. A review of 37 cases. *Spine.* 1997;22(12):1325-1329.